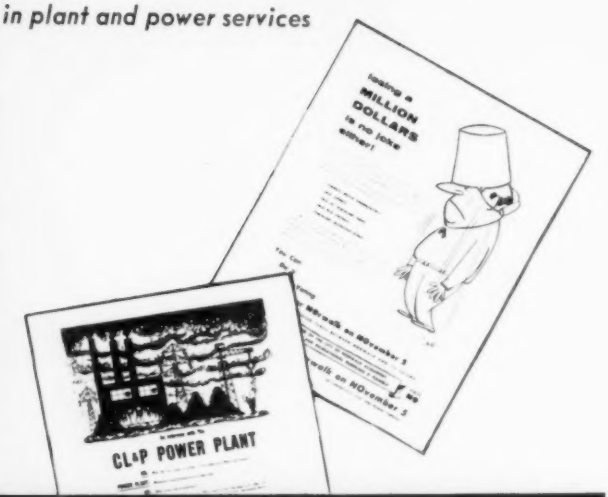
In this issue: — *39 reports of technical developments in plant and power services*

SEPTEMBER 1958

POWER INDUSTRY

PLANT SERVICES—POWER SERVICES FOR INDUSTRY



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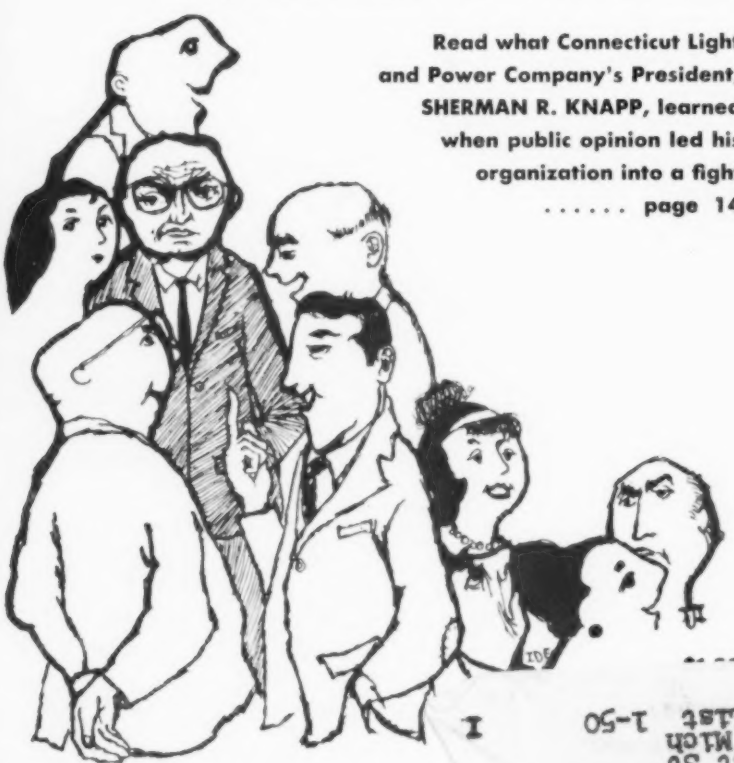
can make a difference in costs – to all industry

Read what Connecticut Light and Power Company's President, SHERMAN R. KNAPP, learned when public opinion led his organization into a fight

..... **page 14**



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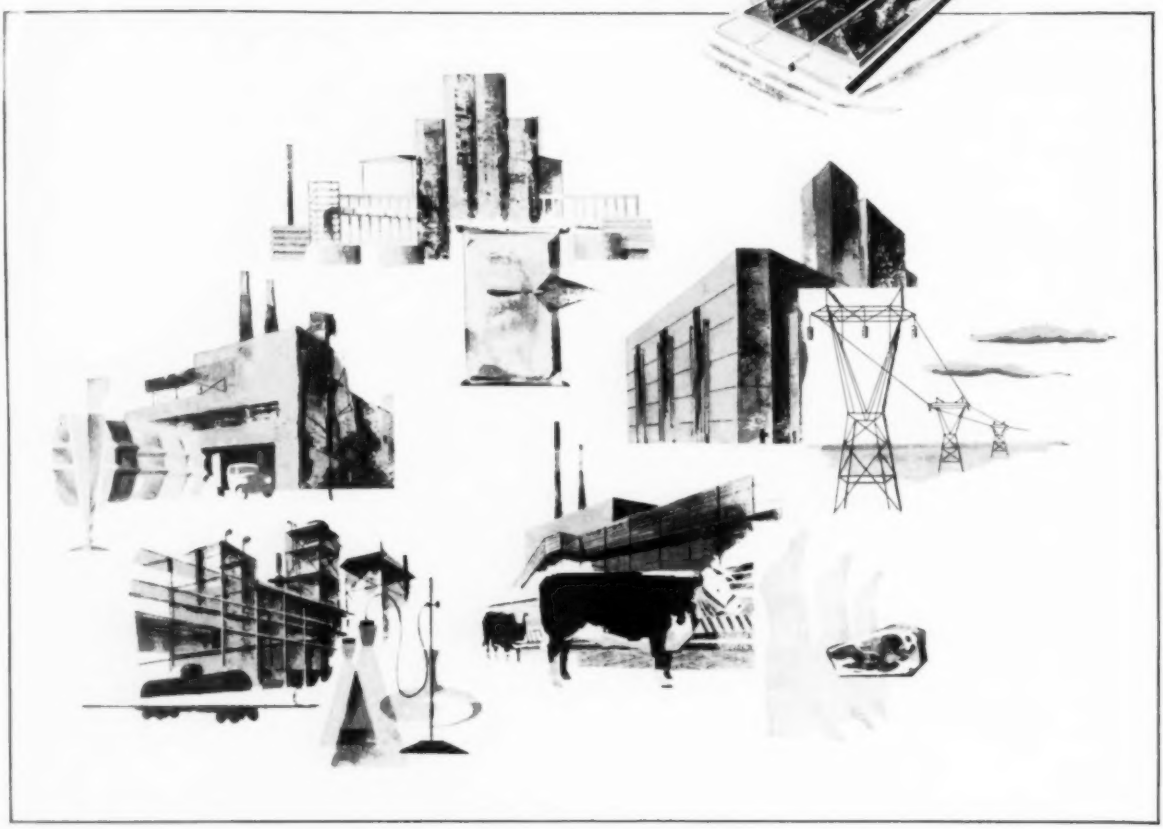

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CONVENTIONS and EXHIBITS

Sept. 3-5: First National Conference on Application of Electrical Insulation, Cleveland, Ohio.

Sept. 4-5: International Conference on Air Pollution; Statler Hotel, New York, N. Y.

Sept. 7-10: Electrical Insulating Materials Association Conference; Carter Hotel, Cleveland, Ohio.

Sept. 7-11: World Power Conference; Queen Elizabeth Hotel, Montreal, Canada. Proceedings will be conducted in English and French.

Sept. 15-17: AIEE Power Industry Computer Conference; King Edward Sheraton Hotel, Toronto, Canada.

Sept. 15-17: Process Industries Conference; Hotel Statler, Buffalo, N. Y.

Sept. 15-19: ISA Instrument-Automation Conf. & Exhibit; Convention Hall, Philadelphia, Pa.

Sept. 17-19: Northwest Electric Light & Power Association Annual Meeting; Sun Valley Lodge, Sun Valley, Idaho.

Sept. 21-24: 38th National Meeting of AICE; Hotel Utah, Salt Lake City, Utah.

Sept. 21-24: Conference of the Petroleum Division of ASME; Cosmopolitan, Denver, Colo.

Sept. 21-28: American Institute of Chemical Engineers; Salt Lake City, Utah.

Sept. 22-25: American Mining Congress Convention & Exposition; Civic Auditorium, San Francisco, Calif.

Oct. 9-10: 21st Annual ASME-AIME Joint Solid Fuels Conference; Hotel Chamberlin, Old Point Comfort, Va.

Oct. 13-15: American Gas Association Annual Convention; Atlantic City, N. J.

Oct. 13-17: American Society of Civil Engineers; Hotel Statler, New York, N. Y.

Oct. 14-16: Joint Conference of ASME Lubrication Division & ASLE; Hotel Statler, Los Angeles, Calif.

Oct. 27-30: Metallurgical Society of AIME, Fall Meeting, Carter Hotel, Cleveland, Ohio.

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September 1958

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PLANT SERVICES — POWER SERVICES FOR INDUSTRY

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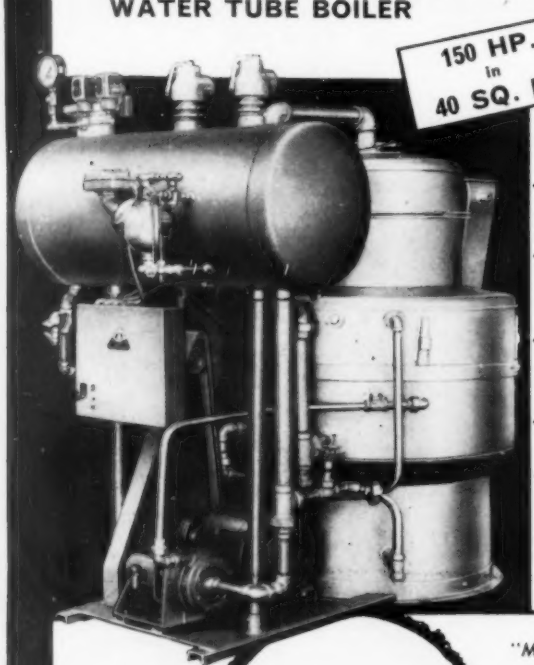
VAPOR

DRUM MODULĀTIC

WATER TUBE BOILER



1/4 the size and weight of other boilers—small enough to fit on a 5' x 8' rug with space to spare!

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REPORTS IN BRIEF

The shape of things to come — fantastic power plants for rockets

If, as a boy, you ever enjoyed reading Buck Rogers, you'll be interested today in reading "Outer Space Propulsion by Nuclear Energy." The former, if you've never seen it, is a comic strip of the future. The latter, 200-odd pages of sober testimony given before the Joint Committee on Atomic Energy.

Just made public, the book is a record of hearings last January and February. Between the lines of deleted classified information and committee's proper interest in appropriations and budget you can learn that:

- A true nuclear rocket (code name "Rover") is planned and will use a high temperature gas-cooled pile to heat its working fluid — probably hydrogen — to high exhaust temperature and velocity. Testifying experts are optimistic about this type of pile for earth-bound power, too.
- Rocket motors now under discussion have entered the "million pounds of thrust" range. At a modest 1000 miles per hour, such a rocket is developing three million horsepower.
- Plasma generators, ion guns, light beams, and light "sails," while not quite available by catalog number, are being talked about quite seriously for use in space propulsion in the next few decades.

It was the consensus among witnesses who appeared that of all propulsion systems currently under consideration, nuclear propulsion appears to offer the best advantages, but it, too, presents some large problems.

The greatest advantage over chemical fuels is that nuclear fuels represent a relatively small weight in themselves for the energy they can develop. But it is difficult to find a good way to use this energy.

It is not possible to construct a simple bomb with an open end. An uncontrolled nuclear explosion would blow the spaceship to pieces.

It is conceivable that a nuclear reactor might be used to heat a conventional fuel which could be expelled at maximum velocity. For significant thrusts, the very high temperatures and pressures necessary for this type propulsion are beyond the capabilities of present metals and ceramics.

Also there are the problems of reactor weight, shielding, and cooling, all of which add to a spaceship's weight to decrease engine efficiency.

Ion Propulsion

Then too, a nuclear power plant could generate electricity. The electricity could be used to create an electrostatic or electromagnetic field to propel ions at a very high exhaust velocity. (Already, a contract has been awarded for the study of ion propulsion using an electric arc. See page 8.)

On the other hand, this theory, as it stands, is highly impractical. The weight of equipment to generate electricity would be so great as to overwhelm any advantage from rapid acceleration of ions.

Work is now going on to find shortcuts to eliminate or reduce the thermal and mechanical stages.

There exists the possibility of applying thermonuclear reactions now under development (see page 6), particularly if one can achieve direct translation of the fusion reaction into electric energy. Here would be a weight saving.

Some of the other propulsion schemes presented were rather ingenious but harder to swallow. One idea called for the gentle but sustained pressure of photons from the sun

to power a ship such as a sailing vessel is powered by the breeze.

Other Considerations

At the other end of the spectrum was the photon rocket. This would produce the ultimate in exhaust velocities — the speed of light. This type of rocket calls for the seemingly impossible total conversion of matter into energy. The committee is not ruling out this idea.

Whatever comes out of this and future work, we can guess, will not be limited to space travel. The same forms of energy which would propel a space ship could be used for other purposes. With the large amount of emphasis being placed on efficiencies in regard to space travel, these schemes, if and when developed, will be significantly practical for everyday uses.

AEC releases 51 more patents

Fifty-one more Government-owned patents have been released by the AEC. The Commission will grant non-exclusive, royalty-free licenses on the patents. This latest release brings the total available for private use to 1448.

The majority of those listed in this latest release pertain to the separation and production of various metals. However, there are several that are of particular interest.

These are patent numbers: 2,686,474 — Electromagnetic Pump; 2,822,472 — Negative Gate Generator; 2,824,365 — Soldering of Aluminum Base Metals; 2,826,624 — Vapor Shield for Induction Furnace.

Copies of patents may be obtained from the US Patent Office.

Applicants for licenses should apply to the Chief, Patent Branch, Office of the General Counsel, US Atomic Energy Commission, Washington 25, D.C.

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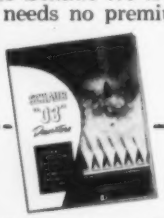

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Circle 9003 opposite last page

REPORTS IN BRIEF

Civilian nuclear power — no boom in sight

If present plans persist, the 1964 total kw output from civilian nuclear power projects will be almost 20 times that of today. However, even at that impressive growth rate, the total output won't come anywhere near to being significant.

According to Lewis L. Strauss, 23 civilian reactors will be generating about 1.3 million kw in 1964. Today, eight civilian power reactors (including experiment reactors) are producing 78,000 kw.

Not only are the proposed projects aimed at non-governmental use, but a good chunk of industry's money is going into them. Now under construction are four plants representing a private capital investment of $250 million and having more than half of the total kw proposed. Not a cent of taxpayer's money is going into these projects.

Industry is also investing more than half the money into eight jointly sponsored projects not yet under construction.

It is hoped that these projects will come up with an answer to the economics problem. As things now stand, a nuclear power plant will not generate electricity as economically as a conventional plant.

The AEC is also hoping that the Euratom program will prove fruitful in this regard. It anticipates that through the program we will learn how to build and operate nuclear power plants more economically.

Already, nuclear power can be competitive in Europe. As reported in this column last month, Britain feels that it will have the cost down below conventional methods by mid-1960's.

Looking into other methods of power generation, the AEC reports that it is encouraged over the results of research in controlled thermonuclear reactions. As a result, about $40 million will be spent on this program in fiscal year 1959.

However, we are not coming close to harnessing nuclear

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Circle 9004 opposite last page

fusion for power. A real breakthrough has yet to be achieved.

Laboratory work has produced bodies of ionized gas whose energy levels appear to be on the fringe of the thermonuclear range. There is evidence that fusion reactions are occurring.

Attempts are now being made to heat the gas to much higher energy levels and to increase the containment time of the extremely hot gas.

Power from Explosions?

Past AEC Chairman Strauss has included power production in a list of possible applications of nuclear explosions. However, he has given no details. What type or how much work is being directed toward this purpose is still a matter of speculation.

The AEC, though, is directing nuclear explosions toward other peaceful uses. Last month, it announced that an Alaskan harbor may be excavated by such an explosion. This has been the first proposed work along these lines.

Offers concentrated diesel fuel additive

In extensive field tests, a concentrated additive for diesel fuel has proven itself capable of increasing power and performance on all types of diesel equipment.

In equipment where moisture is a problem, the material has been effective in combatting the build-up of sludge in tanks. A special blend of solvents and dispersants prevents accumulation of moisture in injectors and pumps, thereby eliminating corrosion at these points.

The additive further protects injectors by leaving a thin film of lubricant on them to reduce possibilities of scoring and pitting.

Recommended dosage is one ounce per twenty-five gal of fuel. The liquid concentrate is packaged in 4-oz bottles, 1-gal tins, and bulk drums.

("Power-Pal" fuel additive is manufactured by The Nutmeg Chemical Co., Inc., 138 Haven St., New Haven, Conn.) Circle 9005 opposite last page.

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F-M Submersible Pumps work silently below ground out of sight

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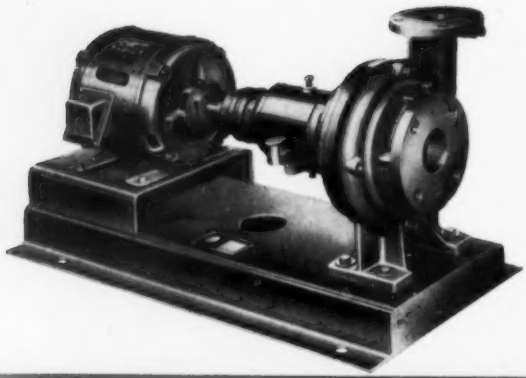
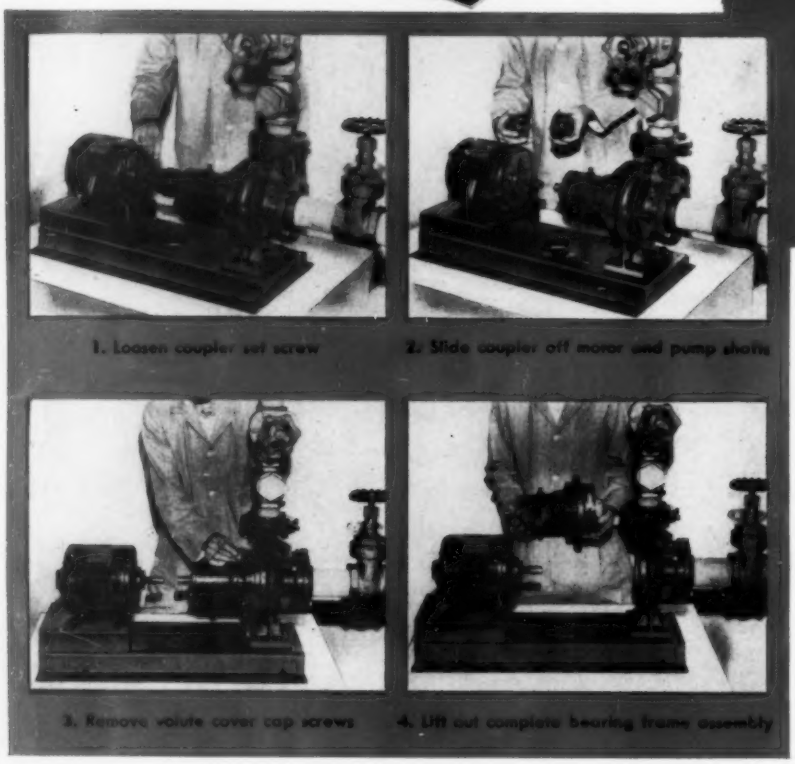


EASY TO SERVICE THIS VERTICAL SPLIT-CASE PUMP

B & G SERIES 1510-B CENTRIFUGAL PUMP


1. Loosen coupler set screw
2. Slide coupler off motor and pump shafts
3. Remove volute cover cap screws
4. Lift out complete bearing frame assembly

The photos show how easily the complete bearing frame, including seal and impeller, can be removed without disturbing piping or motor leads. The unit is replaceable and interchangeable in all pump sizes within limits of material construction.

Other features of the 1510-B include—

Mechanically balanced impeller. Balancing chamber and pressure relief holes in the impeller reduce thrust to a minimum, lengthening pump life.

Solid-type volute with support foot. Can be left in pipe line when servicing pump—rugged construction absorbs piping strains.

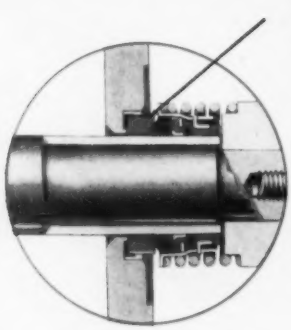
Anti-friction roller bearings. Timken bearings handle thrust and radial loads for smoother, quieter, more efficient operation.

Oil lubrication. No messy, undependable grease cups—circulating oil lubrication assures positive protection to bearings. Oil level indicator permits visual check.

Rugged steel base. Base mounted construction provides a sturdy platform for proper pump and motor alignment.

100% factory tested. Every pump hydraulically tested to meet specified conditions of head and capacity.

Capacities. To 1100 GPM, heads to 420 ft.



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This mechanical seal is self-lubricating. A synthetic rubber bellows seals the shaft. Metal parts are of steel, bronze or stainless steel, depending upon the type of service.

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Circle 9007 opposite last page

REPORTS IN BRIEF

Receives contract to study ion propulsion

Vitro Laboratories, a division of Vitro Corporation of America, has been awarded a contract by the US Air Force to investigate possibility of using the high intensity electric arc for ion propulsion.

The research program will be directed toward ion propulsion engines with exhaust velocities between those obtained by high voltage acceleration of low current ion beams and those generated by chemical fuels.

The general theory being followed is this: The high intensity electric arc, which is similar in concept and appearance to the carbon arc, has an unusual form of gaseous discharge. This discharge generates a "plasma" jet of electrode vapor characterized by high velocity and temperatures of about 7000°C.

At these temperatures all known materials are disintegrated. The molecules are broken down into their constituent atoms, a considerable portion of which are ionized.

It is this phenomenon that may be harnessed as an ion source for propulsion.

Seven companies look for high-temp semiconductor

In a highly intensified cooperative research program, seven manufacturers and industrial users of electronic components are searching for new compound semiconductors for high-temperature transistors and rectifiers.

The program, scheduled to continue for two years, is being conducted at Battelle Memorial Institute. Specifically, scientists will study the properties of three semiconductor compounds — indium phosphide, gallium arsenide, and aluminum antimonide.

The seven companies sponsoring the research include: Erie Resistor Corp., General Electric Co., International Business Machines Corp., Ohio Semiconductors, Inc., Philco Corp., Sarkes Tarzian, Inc., and Texas Instruments Inc.

SEPTEMBER 1958
VOL. 74 NO. 9
POWER INDUSTRY

Using men and sliderules to make efficient coal purchases by large electric utilities is in itself not very efficient. It takes a tremendous amount of manhours to decide which coal to purchase for a particular generating station. In this article, a Commonwealth Edison engineer tells how that company uses computers to make the best coal purchasing decisions

it pays us to use computers to figure coal purchases

LESTER A. EVERS, Senior Engineer, Commonwealth Edison Co., Chicago, Ill.

By the standards of the past, we've reached "impossible" efficiencies in purchasing coal. Quite literally, it would have been impossible to compute all the permutations of factors underlying a coal purchase if all calculations were made by hand.

But now electronic digital computers can evaluate all the available data and decide how much coal to buy, where to buy it, and how to transport it. Commonwealth Edison Company is using four computer programs to do this. Basically they —

- Develop an optimum purchase plan
- Determine coal requirements for each generating station
- Compute coal unit cost (cents/million Btu) at each station
- Check quality of coal purchased and delivered.

In developing the optimum purchase plan before using computers, a definite mathematical procedure was not followed because of the tremendous volume of arithmetic computations required.

When using the computer to perform the multitude of arithmetic computations, the optimum purchase program chooses the coals to be sent to each generating station from a large number of bids.

Coal requirements at each station are determined in a second program. This makes use of coal costs selected in the optimum purchase program. Together, these two programs provide a cyclic process where the results of one program are input to the other. To find an optimum, in this case the minimum overall cost, a number of repetitions of each program must be made.

Our coal unit cost program quickly determines hundreds of unit costs resulting from the combinations of mines and generating stations. During purchase negotiations, the unit costs frequently have to be re-computed with a change in bid prices, Btu content, moisture, ash and sulphur percentages, etc. The computer speedily and economically re-computes the unit costs when these changes occur.

A check of the quality of the coals purchased and delivered includes: taking a sample, performing lab test, and translating lab data into a coal analysis. Computer is used in this translating step.

These computations are simple and straightforward, but with a large number of samples taken daily the task became tedious and time consuming. *In this one operation the computer saves several thousand dollars annually in labor.*

For all coal purchasing using the new techniques and the digital computer, it is estimated that Commonwealth Edison Company saves several hundred thousand dollars yearly when compared to previous hand methods.

Which coal bids should be accepted and to which stations

(*Continued on page* 11)

A step-by-step description of the procedure used by Commonwealth Edison to figure coal purchases appears on next page

Author Lester Evers (right) explains how Commonwealth Edison uses IBM computers to figure optimum coal purchases

COMMONWEALTH EDISON USES THIS PROCEDURE IN ITS COMPUTER PROGRAMS

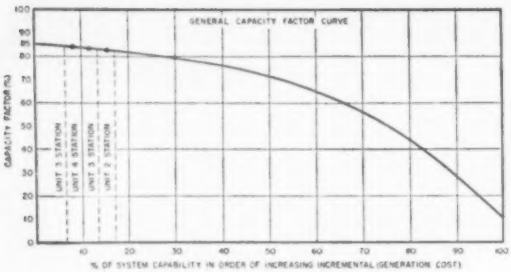

GENERAL CAPACITY FACTOR CURVE
CAPACITY FACTOR (%)
UNIT 3, STATION
UNIT 4 STATION
UNIT 3, STATION
UNIT 2, STATION
% OF SYSTEM CAPABILITY IN ORDER OF INCREASING INCREMENTAL (GENERATION COST)

Fig. 1

1) Generating Station Requirement

With so many variables to consider in the selection of future operating conditions, estimating Btu requirements at each generating station cannot be exact. The method devised uses an approximation based on historical data of generating unit capacity factors and an assumed availability of the generating units.

Such data is shown as a curve in Fig 1. This curve represents the most economical unit as the one with the highest capacity factor, the second with the next highest capacity factor, and so on. Abscissa represents total capacity.

To fit the units available during the year to this curve, it is necessary to align them according to unit cost. This is done by multiplying average heat rate for each unit by incremental coal cost.

Incremental coal cost is the variable for positioning the generating units. It links the linear programming solution to the coal requirement program.

A family of incremental costs for each station is derived from bids allocated in the linear programming solution. Any attempt to use more than a single incremental cost at each station in this program materially complicates the problem. Therefore, only one incremental cost, usually the last or highest, is used.

Total generation for period under study (usually one year) is entered as input in addition to a capacity factor for each unit (read at mid-point of curve assigned to that unit). If there is to be a major overhaul or some other appreciable outage, an availability percentage factor is entered for that unit.

The program, a trial and error procedure, adjusts the capacity factors so that output from all units equals required total. Capacity factors are adjusted by a multiplication factor which starts at $\pm 4\%$ and is cut in half for each trial.

If total isn't reached in six tries, the program restarts itself but uses $\pm 8\%$ for first value.

The generating station requirements is used as input for the linear programming computer program. This latter program will give a set of incremental coal costs (highest cost at each station) used to reassign capacity factors.

Procedure is repeated until lowest overall cost is found. Since the highest cost figures for each station are only ones used, the absolute minimum overall cost may never be reached, and the allocation giving lowest overall cost is taken as a minimum.

2) Coal Unit Costs

If coal is bought annually, each supplier presents a bid in dollars per ton, FOB mine, before the beginning of the year. Coal analysis accompanies each bid.

Mine location areas are separated into freight rate zones by the respective commerce commissions in each state. All mines in one zone have the same transportation costs to a given station.

If there are two modes of transportation (say barge and rail), the cheaper of the two is used. If carrying capacity is exceeded, costs of both types are used separately to find minimum cost.

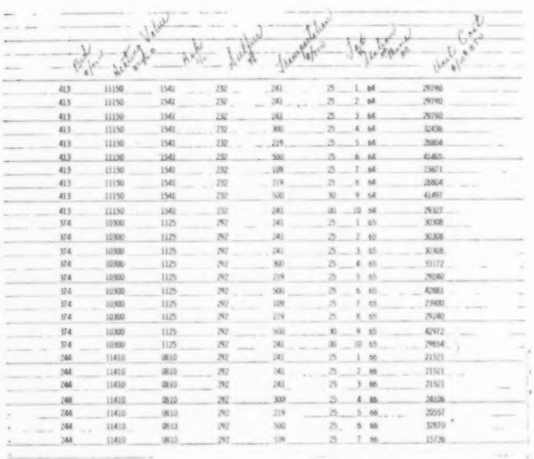
The equation solved by computer:

$$\text{cents/million Btu} = \frac{(\text{coal cost}) + (\text{state tax}) + (\text{transportation})}{\frac{\text{Btu/lb} \times 2000}{10^6}}$$

Coal cost is computed for each mine to each station. Unit cost is adjusted for deviation of sulphur and ash content.

Fig 2 (directly below) shows coal unit cost output from computer program. (*Continued on page* 34)

Fig. 2



3) Quality of Coal

Coal samples are analyzed by conventional Parr Bomb calorimeter method. Test data are recorded as shown in Fig 3.

All values from test are posted directly on this form to reduce possibility of error and to save time.

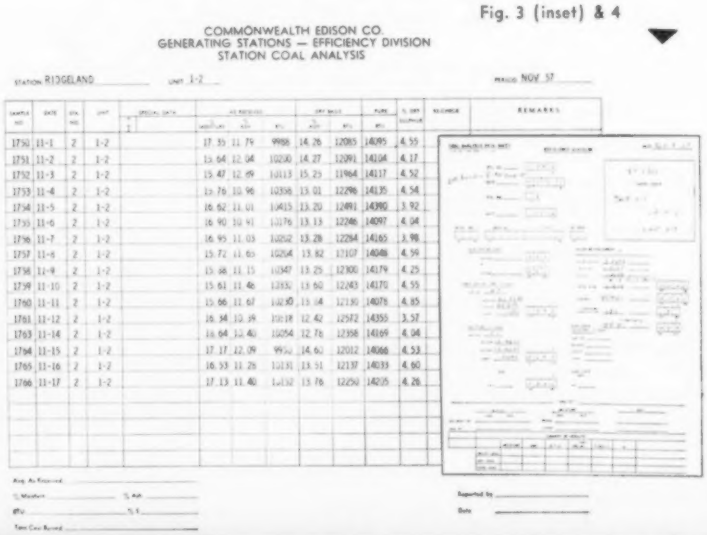
This initial test data form can be used directly for key punching the input data needed by the digital computer to translate the data into the various analyses for each sample.

Edison processes up to 300 samples each week. The computer takes approximately 8 to 10 minutes to compute this number and to prepare a magnetic tape from which a report is printed.

Fig 4 shows the printed form resulting from this program. The computer program checks results for high and low limits and calls for rechecks when these are exceeded.

For coal logistics operation, the requirement is to check quality of coal purchased to insure that it meets bid analysis. For those bids which reappear during the following year's purchases, the results of these analyses play an important part in negotiations with the suppliers.

Fig. 3 (inset) & 4



Electronic Coal Purchase

(*Continued from page 9*)

should these coals be sent to give a minimum overall cost? Linear programming is capable of making this decision.

And, with the speed and accuracy afforded by the digital computer, linear programming permits optimization that previously was economically impractical.

Cost of coal at a generating station varies linearly with tonnage purchased since both price and transportation costs are on a per-ton basis.

Why use linear programming and not a more conventional solution? The reason is simple. If there are more variables than linear equations (this would produce an infinity of solutions) classical mathematical methods cannot be used to find an optimum.

Linear programming provides for the inclusion of restrictions and an objective (maximize or minimize a linear relationship) so that an optimal solution can be had.

One way to solve a linear programming problem is the transportation method. In this method, the calculations are simple additions and subtractions and permit hand calculation even for rather large problems.

It is difficult to say when a problem involving the transportation method is too large for hand calculation, using only a desk calculator. For coal purchasing, a 5 x 10 matrix (5 stations by 10 mines, for example) might be good transitional size to advance to a computer.

Commonwealth Edison has twelve separate generating stations and thirty to fifty suppliers of coal who bid yearly. The matrix size for this situation precludes hand solution.

We use our own IBM 705 or an IBM 650 for the coal purchasing programs. The type or make of machine used is not important. For linear programming, the only requirement is that the program must be large enough to solve the matrix of suppliers and destinations. Availability of the IBM 705, used primarily for customer billing, determines which machine is employed for coal purchasing. ■

Why a Steam Trap Has to Handle "Air"

Low temperatures and corrosion of equipment are often evidence of inadequate trap air venting capacity

Air, with its load of oxygen and carbon dioxide, has an unwholesome habit of interfering with the efficiency of steam heated units. If steam were always free of these undesirable companions, things would be a lot simpler for men-who-operate-plants. Because it isn't, three unhappy situations frequently occur:

1. ***Operating temperatures are subnormal.*** This is a two-part problem. First, an air-steam mixture has a lower temperature than pure steam at the same pressure—see Table A. Secondly, air can "plate out" on heat transfer surfaces as shown in Figure 1. Under some conditions, such an air film will knock down heat transfer efficiency by as much as 50%.

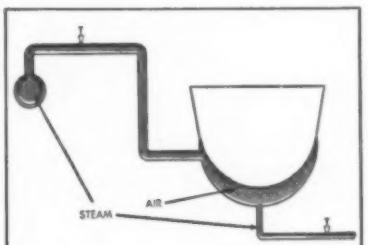


Fig. 1. *How air can "plate out" on heat transfer surfaces. This "insulation" drastically reduces heat transfer efficiency. Armstrong trap operation creates turbulence in the equipment that prevents this.*

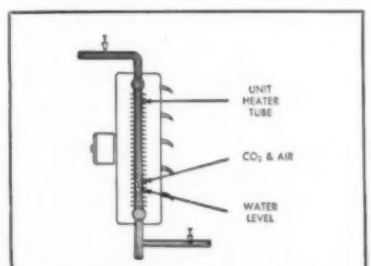


Fig. 2. *Corrosion occurs when units are not kept continuously free of both condensate and air. Armstrong traps discharge both,* at steam temperature, *as fast as they accumulate.*

2. ***Corrosion rears its ugly head.*** Oxygen and carbon dioxide are real trouble-makers. CO_2 gas goes into solution in condensate, forms carbonic acid and chews away at vulnerable metal sections. O_2 aggravates the situation. See Figure 2.

TABLE A—How air reduces steam temperature.

Gauge Pressure	Temp. of Steam with No Air Present	Temp. of Steam Mixed With Various Amounts of Air (% Air by Volume)	
		10%	30%
10.3	240.1	234.3	220.9
25.3	267.3	261.0	246.4
50.3	298.0	291.0	275.1
75.3	320.3	312.9	295.9
100.3	338.1	330.3	312.4

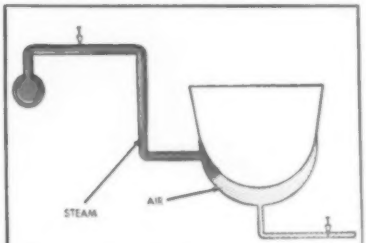


Fig. 3. *When steam is turned on, it takes a trap with extra air venting capacity to provide fast heat-up.*

3. ***Heat-up is slow as a snail.*** Air has a picnic in units that are shut off periodically. Figure 3 pictures the problem. Lines and equipment literally fill up with air. When the steam is turned on it can get in only as fast as the air gets out.

Enter Steam Traps

Curing these steam system ailments involves an operation sometimes called a "trap transplant." It consists of removing traps that don't get the air out and replacing them with traps that do.

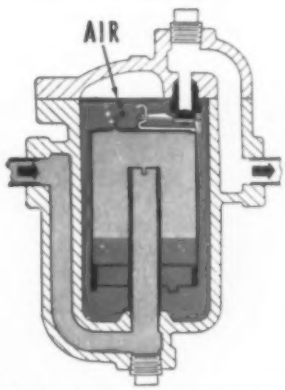
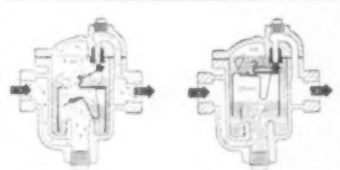


Fig. 4. *Air entering an Armstrong trap passes through the bucket vent and accumulates in the top of trap. When trap opens, air is discharged along with condensate.*

Figure 4 shows how an Armstrong inverted bucket trap continuously vents air. What the picture doesn't show is a built-in plus-value of this trap's design. An Armstrong trap opens suddenly, creating a momentary pressure drop and turbulence in the unit being drained. This breaks up air films and "pumps" air down to the trap so it can be vented.

The vents in standard Armstrong trap buckets will pass all the air normally encountered. In special cases, such as paper machine dryers, the vents are correctly sized larger at the factory to meet the requirement.



Thermostatic vent open. *Thermostatic vent closed.*

Fig. 5. *Open float with thermostatic vent for off-and-on units. When trap is cold, vent is open, permitting air to blow through when steam is turned on. When steam reaches trap, heat closes thermostatic vent. Then, regular bucket vent handles all air coming in with steam.*

Open Float with Thermostatic Vent

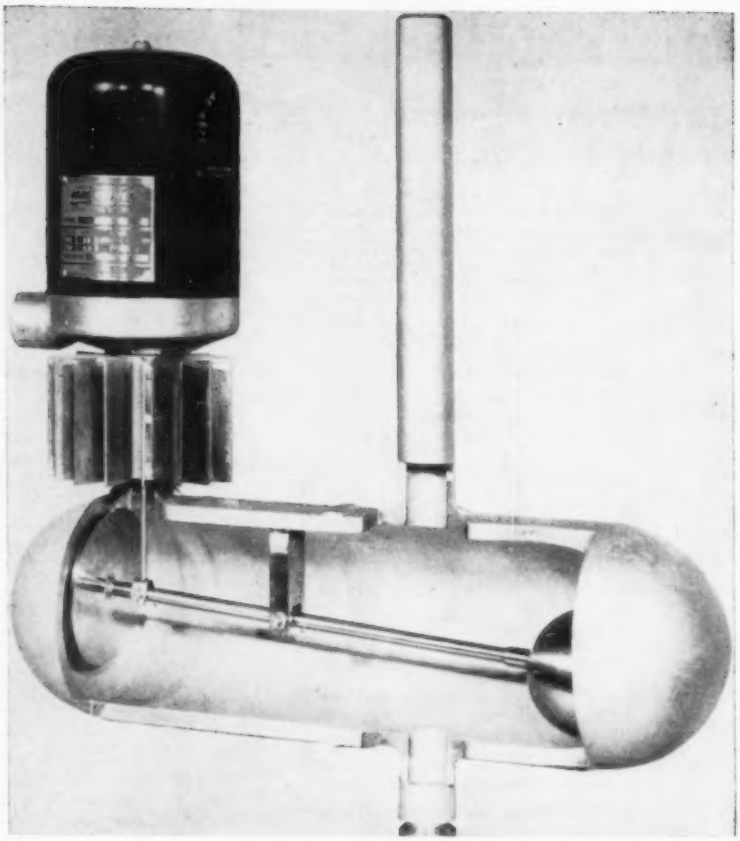
Super air-venting capacity is a must for fast heat-up of low pressure unit heaters, heating coils, steam headers and other units that are on-and-off. Figure 5 shows how the Armstrong open-float-with-thermostatic-vent trap takes care of this.

* * *

The 44-page Armstrong steam trap book covers other features of the Armstrong trap as well as its excellent air handling characteristics. This catalog also discusses trap selection, installation and maintenance. Your local Armstrong Representative or Distributor will be glad to give you a copy. Call him, or write Armstrong Machine Works, 8205 Maple Street, Three Rivers, Michigan.

ARMSTRONG STEAM TRAPS

Circle 9008 opposite last page



Cutaway shows unitary magnetic switch mechanism mounted outside of sealed enclosing tube. The moving magnetic sleeve within the sealed tube at center attracts the permanent magnet (outside the tube) when it is pushed to proper height by the linkage to the float stem. Mercury switch on the armature handles 15 amps at 115 volts

Control liquid level at —and 1000°F

First of its kind, this on-off level control was developed for Chicago's new Dresden Station and

Simple, direct control of liquid level for high temperature, high pressure is now attainable. This device will sense and control liquid level to within a fraction of an inch at pressures of 867 psi *when the liquid temperature is 1000°F.*

While the first use will be in nuclear power, it shows promise for high pressure boilers, hydraulic accumulators, stage heaters and unfired pressure vessels where temperature gets out of hand for conventional controls.

Operation of the instrument is simple. A pivoted ball float within the welded chamber is linked to a magnetic sleeve. This sleeve, while contained in a sealed metal tube, can attract an external permanent magnet switch assembly.

The real trick has been to achieve the all-welded design shown here. There are no gasket connections.

Using a newly developed welding process, the designers have been able to construct the float chamber from schedule 80 pipe. Alloy steel is standard; 304 or 316 stainless can be used. Welding bead can be seen running around chamber's exterior. Branch pipe connections and internal assembly is also welded.

The nipples (also schedule 80 and one inch nominal) are welded to customer piping on the site. Construction permits insulation to be used right up to the chamber itself, though manufacturer specifies that it should not be insulated.

Last weld to be made during fabrication is the one which joins the two halves of the chamber. It is done by a technique developed in connection with construction of the Nautilus.

A weld insert of appropriate metal is fused by an inert gas shielded tungsten arc. After inspection with fluorescent penetrant, weld is completed and machined. Final step is an annealing to restore full toughness and ductility.

Specific gravity limit: 0.65

Float is heavily constructed and counterweighted for reliable operation at minimum specific gravity of 0.65 in liquid level service. In interface applications it may operate successfully with a difference of only 0.5 in specific gravity between the two liquids.

This 0.65 specific gravity rating allows the control to be used in boiler applications up to the maximum unfired pressure vessel code pressure rating. Strictly, however, the device does not fall within the jurisdiction of the code since both its volume and chamber

Table of ASME Boiler and Pressure Vessel Code and ASA Pressure Piping Code

	Allowable pressure in psi		
Temp °F	Unfired Pressure Vessel	Boiler Construction	Piping
—20 to 800	1668	1492	1478
850	1600	1432	1420
900	1455	1302	1290
950	1222	1095	1092
1000	867	776	791

1000 psi

meets ASME safety codes

diameter are smaller than those considered by the code.

(Model 402 level control is a development of Magnetrol Inc., 2110 S. Marshall Blvd., Chicago 23, Ill.)

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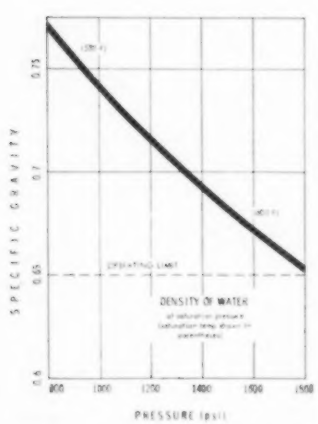
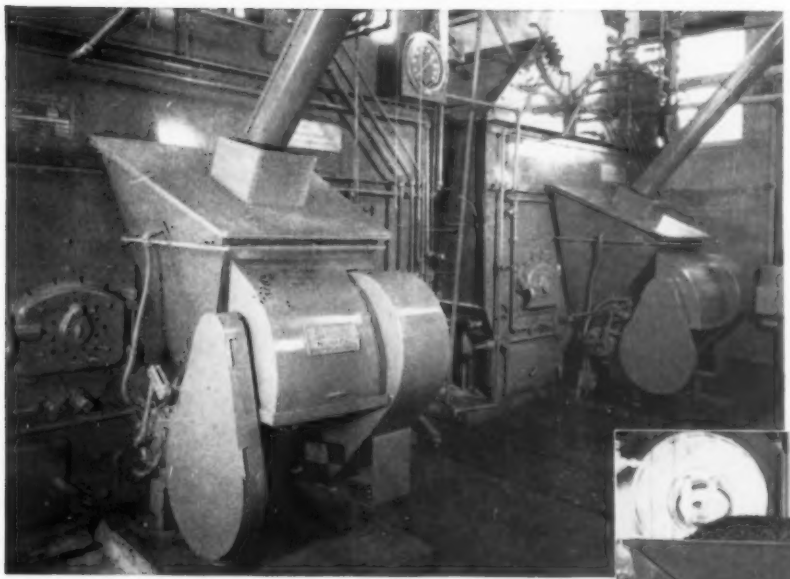


Specific gravity of water at saturation for various pressures. A specific gravity of 0.65 or higher is required to operate the control

Does Your Package* Include

DETROIT STOKER ECONOMY?

*Package Boilers, of Course



Detroit LoStokers firing two Wickes Package Boilers, Type A.O. continuous rating—6000 pounds steam per hour.

As the installation convenience of the package boiler is more and more widely appreciated, the question often is asked "Why can't we have the advantages of a package boiler with the economy of efficient coal firing?"

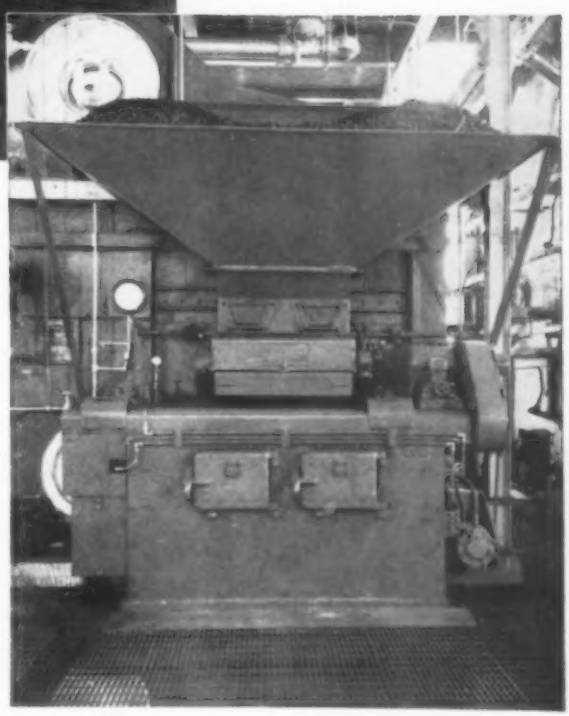
The answer is—you can. Water tube package boilers designed for stoker firing are readily available.

And a *Detroit* Stoker gets the most economy out of coal, the most economical fuel. This economy plus the exceptional dependability and low maintenance of Detroit Stokers assures you steam at the lowest cost.

The Detroit Stoker line includes a number of types specially adapted to package boilers.

DETROIT STOKERS COST LESS . . . COST EQUALS INITIAL INVESTMENT PLUS UPKEEP PLUS PRODUCTION LOSSES DUE TO EQUIPMENT OUTAGE. THE TOTAL IS LESS WITH DETROIT.

Ask for details on Detroit Stokers with package or other boilers.



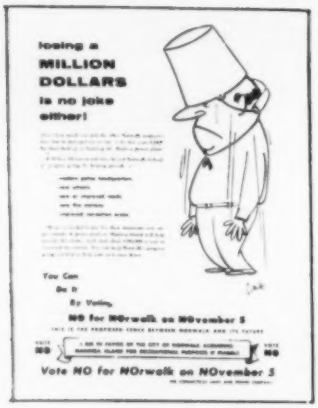
Detroit RotoStoker "CC"—continuous cleaning, Firing Springfield high pressure Package Boiler. Continuous rating—35000 pounds steam per hour. One of five furnished one customer.

DETROIT STOKER COMPANY

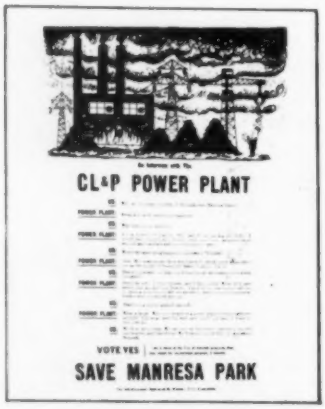
MAIN OFFICE AND WORKS • MONROE, MICHIGAN

District Offices or Representatives in Principal Cities

Circle 9010 opposite last page



THE POWER OF



can make a difference in costs . . . to all industry

"Community Relations" is one of those things which most plants and companies feel can be a vague sort of asset . . . or a vague sort of problem.

Connecticut Light and Power Company's President Knapp knows better. His company turned what started out to be a nasty fight into *public understanding — at a profit!*

By **SHERMAN R. KNAPP,** President, Connecticut Light and Power Company

THE MANRESA CASE seems to have become a classic in public utility operations with the public. It had everything, embodying every branch of law and public communications, from the first stirrings of local sentiment to a place on the ballot in a city election. In the struggle for public opinion, just about every tool in the kit was used. It has even been chosen as a case study at the Harvard Business School.

It began in 1952 when we bought an island off Norwalk, Connecticut. For years, we had been searching for a waterside plant site. Such a plant would allow us to meet the growing demand for power in Fairfield County, the southwestern stub of Connecticut that reaches within 30 miles of New York City.

Both residential and industrial use have made this one of the fastest-growing sections of the State — and the country.

Actually, Manresa is not an island, but a fist of land at the end of a thin arm of causeway which puts it a good half mile from the nearest habitation. It is ideally suited to generating plant purposes with respect to both cooling water and water-borne delivery of fuel.

There was an immediate protest from several neighborhood groups who felt that a power plant — even one a half mile or more away — would not be the most desirable addition to the harbor.

The opposition was well organized, and well heeled. They made their presence felt at the Zoning Commission's public hearing in December 1952. Actually that hearing involved no change in zoning because the local commission is authorized to permit utility company construction regardless of zoning.

However, at the hearing, I described the proposed plant, the increasing power needs of the area, pointed out that the new facility would not be objectionable. It would employ some 70 people with a payroll of $260,000, and would up the Company's tax payments in Norwalk about $200,000 a year.

In advance of the hearings, we had flown a group of Norwalk citizens including the Mayor and representatives from the Norwalk Chamber of Commerce to Rochester, New York, to let them see for themselves the good neighborliness of Rochester Gas and Electric's Russell Plant on Lake Ontario.

Following the hearing, the Zoning Commission took the matter under advisement. In January of 1953, they visited the new plant of the Long Island Lighting Company in Port Jefferson, Long Island, which is also on a beautiful harbor, familiar to all yachtsmen of the area. In January 1953, the Zoning Commission voted three-to-one to approve the construction of the plant with appropriate restrictions on smoke, noise and water pollution.

Following the approval of the Norwalk Zoning Commission, there were numerous legal maneuvers on the part of the opposition in their efforts to forestall the construction of the plant. The situation finally resolved itself into an appeal to the Connecticut Public Utilities Commission.

The hearings on this appeal were not concluded until June 1956. They consumed 17 days and involved over 2,000 pages of testimony.

In October 1956, the PUC affirmed the Norwalk Zoning Commission's action and the opposition promptly appealed the PUC decision to the Superior Court. When the Superior Court upheld the PUC decision in its order issued just a year ago, in June 1957, the opposition still continued the legal battle by appealing to the Connecticut Supreme Court of

PUBLIC OPINION

Errors, the highest court in the State.

This has been a dull recitation of legalistic maneuvers for which I apologize. But it helps to set the stage for the real struggle for public understanding. The principal argument of our opponents was that the presence of the power plant would depreciate the value of their property.

They realized as early as 1953 that to gain public support for their cause they had to adopt a more positive approach. This took the form of an attempt to sell the citizens of Norwalk that Manresa Island was needed as a public park, complete with boat moorings, swimming pool, beaches, playgrounds and all.

While the legal battle was going on in the courts, the whole question was, in effect, put up for public referendum at the time of the municipal election last November. The question which the opposition forced on the ballot by petition read "I am in favor of the City of Norwalk acquiring Manresa Island for recreational purposes, if feasible."

In order for this expression of opinion to become a directive to the City Council to act, the majority of the votes cast on the question would have to be "yes", and — more important from a practical standpoint, the "yes" votes would have to total 25% of the total registered voters.

Our lawyers advised us that even if the opposition got enough "yes" votes to win, the City could not condemn the property we owned because it was already held for public use. Last summer our political advisers said that in all probability the opposition would have enough "yes" votes by the time of the election in November to outnumber the "no" votes, but that it would be very unlikely that enough people would actually vote on the question to fulfill the 25% qualification.

Last September we had a professional survey made to determine the public attitude toward the referendum. This showed that 43% favored the City condemning Manresa Island for recreational purposes. Twenty-three percent were against condemnation by the City, and 34% had no opinion. In other words, of those expressing a positive reaction, the opponents were leading by about two-to-one.

The situation posed a real question of policy for us. Both the legal situation and the political situation seemed to say that we had only to keep quiet and we would survive by default.

Should we take the chance of trying to win public support for our position in the face of what seemed to be rather tough odds? This was a question no court could answer for us in the orderly procedure of law. This was a question we had to answer ourselves in the give-and-take of public opinion.

This was a matter of public relations in the purest and coldest definition. Should we answer the question? Could we afford to face it? Could we afford NOT to face it?

A description of a few of

(*Continued on page* 18)

Public opinion can do a lot for you. And our experience has taught us, inferentially at least, what it can do *to* you.

Even if you make the utopian assumption that you're doing the best possible job of supplying electric service — or whatever your company produces — you cannot go far in molding public opinion unless you are also doing that sort of a job with the people you serve.

Of course, as a utility, we are in a peculiar business because our product is invisible. It cannot be packaged, but only measured.

People exercise considerable freedom in choosing what they eat, drink, or drive. Electric power has no such dimension of preference. Nor does electric power arrive in a carton with a four-color label, though I wish it did.

Other products may provide prestige or a glow of satisfaction, but the average electric customer has only three normal contacts with us...

- When he pays his bill
- When the meter reader walks across his flower bed
- When the lights go out.

Even in disasters — and in the recent past we've had a few hurricanes, two devastating floods, and assorted ice storms which left thousands of people without light, heat, freezers, and water — we were faced with public relations problems. I'm still humbled by the faith and patience of these people that somehow, sometime, and as soon as possible, we would get there, and the lights would go on again.

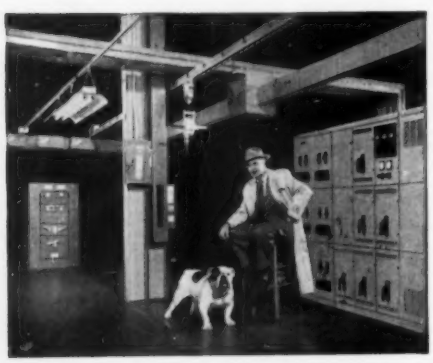
And even in these situations we have refused to face the difficult, evaded the unpleasant, and lived with the admission of corporate cowardice that argues "pull down the shades, don't answer the door, maybe they'll go away."

Is public relations a vague concept and unimportant to you? I don't think so. The story of what happened to us — and it could happen to you — shows what can be done by using public relations on your own home grounds and by going straight to the people.

—Excerpted from a recent talk given by Mr. Knapp

S. R. Knapp
President
Connecticut Light and Power Company

Aluminum Lo-X®—*easy to install, economical, efficient*



VERSATILE ALUMINUM Lo-X combines with BullDog Plug-in-Duct, power panels, substations, Trol-E-Duct®, switchboards, safety switches and Electri-Centers® to form a coordinated distribution system that delivers power when and where you need it.

Our field engineer explains how easily Lo-X BUStribution® duct installs. All Lo-X bus sections have rigid scarf-lap joints which can be connected with just a wrench and screw driver. And light aluminum bus bars put less strain on building superstructure.

Even before Aluminum Lo-X is installed you can know what the voltage drop and operating temperature of the feeder system will be. Lo-X saves space, too! It installs edgewise, flatwise, even around corners—is factory prefabricated to fit your building structure.

Look into Lo-X and its partner Plug-in-Duct®. Contact your electrical contractor or BullDog field engineer or write BullDog Electric Products Co., Detroit 32, Mich. © BEPCO

BULLDOG

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HEAT BETTER ELECTRICALLY

THAT'S INTERESTING

Let George do it!

George, a high-speed digital electronic computer that can add 200,000 sums per second, is now saving many man-hours at Argonne National Laboratory's Applied Mathematics Division.

George can play checkers, translate from a foreign language, or predict the outcome of an election — but Argonne scientists will forego such frivolities and keep George occupied calculating, in minutes, problems that would take thousands of hours by hand methods.

Designed and built at Argonne, George runs on electricity produced by atomic power.

What a pickle!

Pickles now receive 15,000-volt shock treatment that cuts curing time from two months to five days.

For more information on product at left, circle 9011 see information request blank opposite last page.

Still wet, the two storage water heaters (copper silicon on left, copper-lined on right) are inspected for signs of corrosion. After 27 years of operation, neither shows signs of wear or corrosion. Since installation, the two heaters have processed 17 million gal of water at average of 8 tons per day

Bronx County Courthouse installed storage water heaters of different materials to study their individual service lives, and now . . .

27 years later: no sign of wear with copper-lined water heater

TWENTY-SEVEN years ago, the Bronx County Courthouse decided to make an experiment. They installed two storage water heaters of different materials of construction to see which gave the better service.

The storage heaters were alike in design, but one was made of a copper silicon alloy and the other was a steel shell lined with copper.

Desiring something that would last a long time, the Department of Public Works specified copper silicon — at that time, a new alloy. The water heater manufacturer pointed out that a copper-lined heater would provide same service as the more costly alloy.

The Department, viewing the different specifications as an opportunity to compare both metals for future installations, ordered one of each. They were installed side by side.

Although they have been inspected annually since their installation, a special inspection was recently made to compare corrosion-resistant properties and service life.

This is what they found: all original fittings are in good operating condition; the copper tube bundles and supports show no sign of wear or corrosion. Present indications are that copper, in comparison with the copper alloy, is as effective and economical a metal for storage heaters.

Except for metal composition, the heaters are exactly alike — 12 ft long and 4½ ft in diameter, with heating capacity of 4560 gal per hr from 40°F to 180°F using steam at 5 psig.

In the past 27 years, the two heaters have processed some 17 million gal of water at an average rate of eight tons per day to provide rust-free hot water.

(Storage water heaters were manufactured by Patterson-Kelley Co., Inc., East Stroudsburg, Pennsylvania.)

Circle 9012 opposite last page.

RAMBLINGS ON INSTRUMENTATION

Tom Schwift and His Marvelous Flow Transmitter

ONE somnolent August morning, as kindly old Dr. Harding was potting some tea roses in his greenhouse, his attention was distracted by a familiar rapping at his door. "Tom Schwift!" he exclaimed. "Come in, lad!" A moment later Tom Schwift (for it was indeed the young inventor) strode through the door.

"Aha, young Tom!" exclaimed the professor. "Tell me, what have you been inventing now, for I detect a note of ill-suppressed excitement in your demeanour."

Blue eyes a-twinkle, the young genius nonchalantly vaulted a row of nasturtiums. "Oh, nothing much," he remarked casually. "Come have a look."

"Smaller than a breadbox!" expostulated the professor.

Back at his laboratory, young Tom beckoned casually toward a draped object in the corner. Spine a-tingle with anticipation, the beloved old professor snatched aside the drape. A gasp escaped his beloved old mouth. For, truly, this latest invention appeared a worthy successor to The Electric Bath Mat, The Automatic Gravy Boat and The Mechanical Chicken Plucker which had brought fame to the modest young genius.

Brushing the mist from his wise old eyes, Professor Harding queried, "And, pray tell, what is it, boy?"

Quelling his amusement at his elder's ignorance, (for he was never one to display impatience in the presence of less nimble wits), young Tom launched into an explanation.

"I've dubbed it the Tom Schwift Flow Transmitter, sir," bespoke the lad, modestly lowering his lashes.

"Bless me!" expostulated Dr. Harding. "But——"

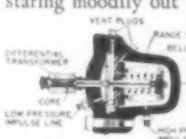
"Notice," Tom went on, "that the entire unit is hardly larger than a steam turbine. Pressure differentials are recorded in this seven-gallon mercury tube, activating a cleverly designed torquing system, which in turn is transmitted to a series of bellows, forcing air into a Navy weather balloon. In early tests, the balloon frequently sailed off with the whole shebang. This difficulty I resolved by bolting the unit to a concrete slab."

Dr. Harding nervously polished his pince-nez. "My boy," he pontificated gently, "the best of us occasionally . . . ahem . . . well, *goof*!"

"You mean . . .?" stammered the lad.

"I fear it is all too true," interjected the older man. "Yes, young Tom, once again Hays has beaten you to the punch! The Hays Model 245 Differential Pressure Transmitter has many points of clear superiority over your crude contraption . . . and, upon my word, over all the devices I know about in the flow measurement dodge."

"Smaller, I suppose," brooded Tom, staring moodily out the window.



"The Hays Transmitter is frictionless and liquid-free."

"Smaller than a breadbox," rejoined the other. "Also there are no torque tubes, gears or like that . . . *nothing*, my boy, in the way of mechanical friction. The differential transformer core moves *directly* with the bellows. And the Hays transmitter uses none of that costly mercury, lad. It is liquid-free, the only sensing unit being the single element bellows."

"Jehosophat!" muttered Tom testily.

Warming to his subject, the kindly professor continued: "Another fascinating spec of Hays Fantastic Flow Transmitter, if memory serves, is a guaranteed recorded accuracy of ±¼% of full scale signal above 10% of scale!"

Sensing that his young associate had ceased paying attention, Dr. Harding tiptoed to the door. Closing it gently, he heard the blue-eyed young genius muttering . . . "Wonder if those chaps at Hays have thought of an electric salt shaker!"

(Gentle reader, write for Bulletin 58-1228-107 or "The Hays Boys in the Catskills.")

Phil Sprague Jr. President

THE HAYS CORPORATION · MICHIGAN CITY 2, INDIANA

Circle 9013 opposite last page

Public Opinion

(Continued from page 15)

the paid advertisements run by the opposition will give you an idea of the climate, of the heat and the hatred in which we had to live.

They Fight Us

One advertisement (top left, page 14) showed that our testimony stating that the proposed plant would not be a nuisance did not cut much ice with our opposition. Their illustrations of the plant continually pictured conditions that any self-respecting plant engineer would have been ashamed of fifty years ago.

Another ad did not say anything about the more than 98% of the fly ash that the electrical and mechanical precipitators would remove from the stack gases. While the figure it gave — 5.4 tons of ash discharged per day — was about correct for the ultimate development of the plant, the illustration was misleading to say the least.

Air pollution from fly ash and also from wind-blowing coal dust from the pile constituted the favorite argument used against the plant.

A "Save Manresa Park" ad showed a variation of the same theme. It presented a figure of $3.84 as the opposition's calculation of the per capita tax saving resulting from the increase in the grand list which will be afforded by the plant.

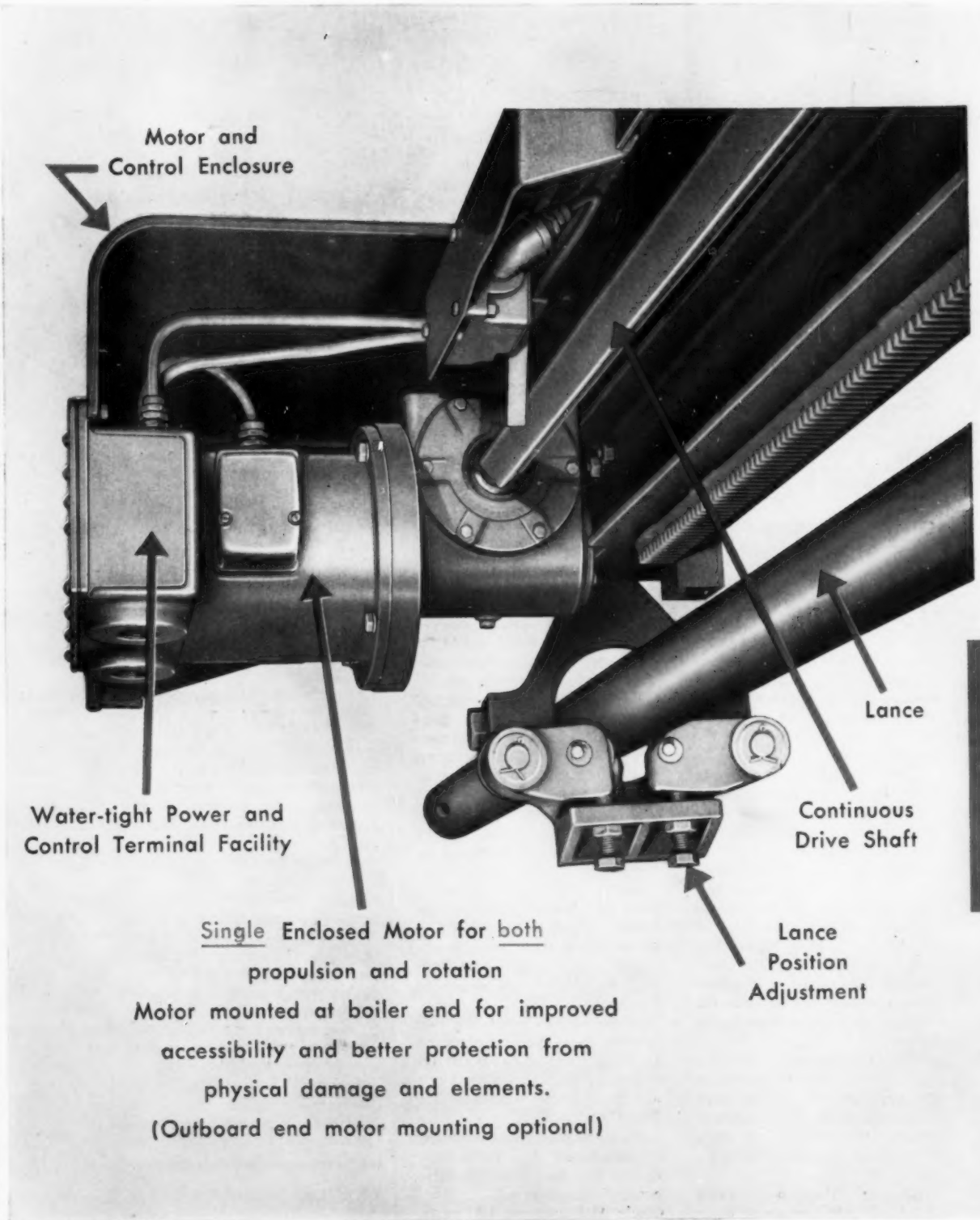
We wondered what we should do about this new and obviously professionally-planned onslaught. We were conditioned by public utility traditions to ignore it. But that wouldn't make it go away.

We Fight Them

We decided to fight for what we believed in. We decided to go directly to the anonymous and amorphous public to state our case, to ask for understanding. We actually took an active part in a political operation.

In our advertising we stressed the financial benefit of the plant to the City of Norwalk. We pointed out as often as possible the many things that the citizens of Nor-

FRONT END



Single-Motor DRIVE

another important feature of

New Diamond

Series 300 IK
LONG RETRACTING BLOWER

As illustrated at the left, only *one motor* is used to simultaneously propel and rotate the lance tube of the new Series 300 IK. The motor is stationary and is mounted at the boiler wall for easier accessibility and greater protection from physical damage and the elements (note the protective enclosure). This front end single-motor drive is simple and dependable. There is only *one* set of motor elements . . . *one* set of control elements . . . and *one* set of power supply facilities to operate and maintain.

Additional important features of the new Series 300 IK are listed in the panel below. Check them and you will understand why this blower is establishing a new standard of efficiency, economy and dependability in cleaning those heating surfaces that require a long retracting blower. For further information about the new Series 300 IK, ask your local Diamond office or write directly to Lancaster for Bulletin 2111 PI.

SERIES 300 IK—LONG RETRACTING BLOWER

OTHER ADVANTAGES OF SERIES 300 IK BLOWERS

- **Backbone and Protective Cover**
- **Compact, Accessible Electric Power and Control Terminal Facilities**
- **Nozzle-Sweep-Every-Inch Cleaning Pattern**
- **Improved "Type A" Nozzle**
- **Positive Gear Carriage Drive**
- **Poppet Valve with Adjustable Pressure Control**
- **Positive Mechanically Operated Valve**
- **Single Point Outboard Suspension**
- **Oversize Lance (Step-Tapered for Extra Long Travel)**
- **Auxiliary Carriages for Extra Long Travel**
- **Designed for Quick, Easy Servicing**

No other blower gives you all these advantages.

Diamond **DIAMOND POWER SPECIALTY CORPORATION**

LANCASTER, OHIO

Diamond Specialty Limited
Windsor, Ontario

8083

Circle 9014 opposite last page

walk wanted which could be bought with the extra tax money from the new plant — better roads, better schools, a new police station, etc.

Another ad again pointed up the financial importance of the plant to the City by citing the loss of a million dollars to Norwalk because of the five-year delay in starting construction.

They bought ads, we bought ads. They had bumper stickers, we had bumper stickers. They took to the radio, we took to the radio. I never knew there were so many ways to get a message across.

And We Won!

And you know what? We won by more than two-to-one. The total number of registered voters in Norwalk at the time of the election was 31,637 and the total vote cast on the question was 17,029 which was more than the total vote cast in Norwalk during the 1956 presidential election.

There were 11,424 "no" votes to 5,605 "yes" votes. In other words, the people of Norwalk were opposed to the City taking our site for park purposes by a very impressive majority.

Both sides, as I have said, used all the familiar mechanics of public relations, press relations, and publicity operations. But it is too simple to say that we won "by enlisting public understanding".

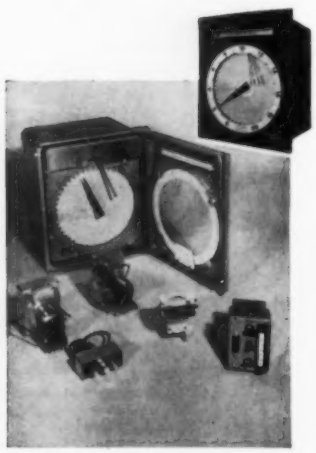
I am not sure that "The Public" is anything more than a political or pseudo-statistical expression. All I know for sure is that some of the things we did, or said, or stood for somehow reached the *thinking* people, whose own understanding created public decision that could finally be tabulated on a voting machine.

We learned that you can't possibly reach everybody but you can reach the somebodies who really make up the public mind.

I am glad to report that a few months ago the Connecticut Supreme Court of Errors upheld the decision of the Superior Court, and construction of the Norwalk Harbor Plant has finally begun. ■

NEW DEVELOPMENTS

plant services — power services maintenance



Four components for four signals are housed in one instrument (inset upper right)

Non-linear variables recorded linearly

Cams "straighten" flow or other signals for four-record universal recording instrument

UP TO FOUR records can be made on one circular chart with linear calibration by electronic recording instrument. Called a "universal" recorder, it uses a cam in each input circuit to "straighten" non-linear input signals. Thus it can be used wth any four non-linear inputs such as: flow, gas analysis, pH, pressure.

Two types of receivers are available for this recorder:

- Differential transformer receiver is designed specifically for manufacturer's standard transmitters of pressure, temperature, flow or other input motions.
- Second electronic receiver is a slide wire type (also embodying cam) for use with AC resistance bridge or DC potentiometer.

Voltage standard of the instrument is stable enough to hold variations to ±0.05% for ±20% supply voltage change. No standard cell or dry batteries are required. No vacuum tubes are used either.

Two mechanical integrators may be embodied in the recorder and read without opening instrument door.

Pneumatic transmitters or control elements can be used with the instrument system.

High input impedance, high-gain amplifier handles 10 to 100 mv spans with ±0.1% sensitivity ±0.25% accuracy. At smaller spans ±10μv sensitivity is obtained.

(Universal electronic recorder is a development of The Hays Corporation, Michigan City, Ind.)

Circle 9015 opposite last page.

Non-slip surface sticks in place

For quick application to steps, slick floors, pulleys

A roughened surface rubber composition has been combined with tough adhesive to produce a non-slip surface which can be applied widely.

Typical applications may include:

- Walks, stairs, ladders
- Halls and corridors
- Locker rooms, showers, other locations having a "slick" floor hazard
- Near maintenance locations where grease or oil may be a problem.

One novel but practical use may be providing added traction on flat pulleys. This could be done without increasing pulley diameter appreciably since thickness of the material is about 1/20 inch.

Made of bonded particles, the covering is non-sparking, non-abrasive, resistant to oils, chemicals, solvents and many acids. It is available, too, in beige, black and gray to match room decor where this is a factor.

Standard sizes are 96 foot rolls 4, 6, 12, 18, 24 or 36 inches wide. Strips are also available, as are 9 x 9" tiles. Custom shapes can be cut on order.

(Scotch-Tred is a development of Minnesota Mining & Manufacturing Co., 900 Bush St., St. Paul, Minn.)

Circle 9016 opposite last page.

Kit furnishes components for traveling crane

Essential components or all components for overhead bridge cranes of various decriptions are available as a

manufacturer's kit for crane construction on the site.

Typical three-ton, 50-foot span bridge crane purchased in this way would cost well under $1000. And further economies are possible.

For example, standard components such as I-beams, cross shafts, etc, can be purchased locally.

Cranes available in this way range in capacity from half ton to ten ton; they accommodate spans from 14 to 50 feet.

(Type NH-SUH cranes are manufactured by Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., Muskegon, Mich.)

Circle 9017 opposite last page.

Porous filter media resist temperatures up to 1830°F

Have modulus of rupture value of 3230 psi

Uses: Although designed primarily for liquid filtration, materials can also be used for gas diffusion, purification of air, hot gases flow control, burner plates.

Features: Porous materials have particle retention ranging from 20 to 120 microns. Filter rated at 50 microns will retain 98 percent of all particles larger than 50 microns.

Materials can withstand temperatures up to 1830°F with no effect on physical structure. Modulus of rupture value is 3230 psi at room temperature.

Porous filter media have particle retention ranging from 20 to 120 microns

Description: Porous filter medium has specific gravity of 1.95. Tensile strength is comparable to that of completely

vitrified glasses. Material has been "down-shocked" from 900°C to tap water in sections 3/16″ thick without fracture. It has also withstood "up-shock" from room temperature to 1000°C without fracture in sections 3/16 inch thick.

Product is available in large variety of shapes, including discs, tubes, plates, cups, and pellets. Discs range in size up to 1″ thick and 4″ diam. Tubes range in length up to 18″ and diam to 2¾″ in wall thicknesses of ⅛ to ¼″. Dimensional tolerances on discs are ±2 percent in diam and ±0.010″ in thickness.

Porous filter medium is resistant to most common chemicals except hydrofluoric acid and hot, strong alkalis. Laboratory solubility tests show 0.23 percent weight loss when immersed in 25 percent sulfuric acid at 95°C for 10 days. A 0.46 percent weight loss was reported when immersed in 25 percent nitric acid under same conditions.

Several cleaning methods are possible in filtering applications. Backwashing with clean water is satisfactory in some cases. Use of an acid solute to dissolve impurities is also acceptable in many applications. Firing is another effective way in which organic material may be burned out of clogged pores.

(Further information about porous filter media can be obtained from Corning Glass Works, Corning, New York.)
Circle 9018 opposite last page.

Swirls sand and silt out of water flow

Operating like a conventional cyclone, wet classifier removes sand and silt from flowing water. It is particularly efficient in the removal of particles above 200 mesh — the usual culprits in damaging distribution systems. Removal extends, however, down to 500 mesh (30 micron) particles.

Rubber lined, the classifier has a conical shape. Tangential entry sets up swirling motion which throws particles to the periphery.

Units are available in diameters of 6, 12, and 24 inches, size depending on capacity requirements and flow variations.

Walls guide sand down cone into underflow chamber. This

Cyclones are 6, 12, or 24 inches in diam

is drained periodically — either automatically or manually. Desanded water overflows cyclone's top.

Commonly, installation discharges treated water from the cyclone into the mains at line pressure. Cyclone is then mounted vertically and standard underflow arrangement used. System can, however, be operated to discharge at atmospheric rather than line pressure.

At Hobbs, New Mexico, one 24-inch unit, on test, handled average flow of 1.26 mgd averaging a removal of 673 pounds of sand per day. During the 70 day test, it knocked out 24 tons of sand.

(DorrClone Desanding System is a development of Dorr-Oliver, Inc., Havemeyer Lane, Stamford, Conn.)
Circle 9019 opposite last page.

RETURN LINE CORROSION *Can* BE LICKED!

Drastic reduction of return line corrosion in an easy, effective and economical way has been the unanimous experience of hundreds of plants throughout the country using Bird-Archer's Amine Treatment.

A plant in New York State, generating approximately 500,000 lb. of steam a day, had a normal condensate pH value of 6.3 that resulted in almost constant piping replacements. Only 6 lb. per day of Bird-Archer's Amine Treatment cut maintenance costs to a new low by raising the pH value to the safe range of 8.0 to 8.5.

A plant in New England, generating 600,000 lb. of steam a day, did not have an open feedwater heater which would mechanically eliminate the exceedingly high CO_2 content of their makeup water, consequently, the pH value of their condensate was sometimes as low as 5.9. Less than 12 lb. of Amine Treatment a day raises the pH value of the condensate to 8.5, eliminates excessive corrosion.

After two years of experience with Amine Treatment a power plant in Massachusetts, making 250,000 lb. of steam a day, enthusiastically reports that they eliminate over 75% of their piping replacements through the use of only 2 or 3 lb. a day of Amine Treatment.

Return line corrosion has been licked at these plants. Let a Bird-Archer Service Engineer help you solve *your* corrosion problems.

Write for Bulletin CP100 and the name of the Bird-Archer Service Engineer nearest you.

BIRD-ARCHER
WATER TREATING CONSULTANTS
The BIRD-ARCHER Company, 4337 N. American St., Phila. 40, Pa.
New York • Chicago
The BIRD-ARCHER Co. of California, 415 Brannan St., San Francisco
Offices in Canada and Mexico

Circle 9020 opposite last page

COST REDUCTION* AND INCREASED PERFORMANCE

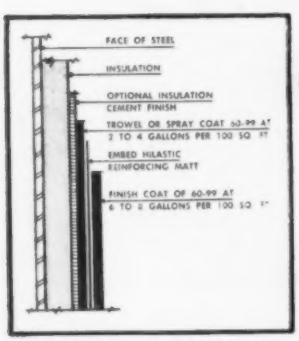
with *hi LASTIC* mastic and matt for Thermal Insulation Protection

REDUCE

1. **DRIED FILM THICKNESS**
2. **MASTIC APPLICATION COST**
   (HiLastic—first fibrated emulsion mastic suitable for spray application)
3. **RE-INFORCING MEMBRANE APPLICATION COST**
   (HiLastic Matt . . . flexible and easily imbedded. No re-inforcing imprint.)

INCREASE

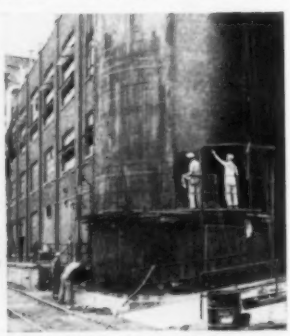
1. **FLEXIBILITY**
   Eliminates expansion cracks
2. **RESISTANCE TO PHYSICAL ABUSE**
   New concept of flexible reinforcing membrane gives added strength to mastic film.
3. **DURABILITY**
   Weathering resistance improved with less film thickness.


FACE OF STEEL
INSULATION
OPTIONAL INSULATION CEMENT FINISH
TROWEL OR SPRAY COAT 60-99 AT 2 TO 4 GALLONS PER 100 SQ. FT.
EMBED HILASTIC REINFORCING MATT
FINISH COAT OF 60-99 AT 6 TO 8 GALLONS PER 100 SQ. FT.

Application drawing is not made to scale.

HERE'S HOW

HERE'S RESULT



Foster HiLastic Mastic and Matt as applied to tower at The Mead Corporation plant, Chillicothe, Ohio.

*Actual job figures available with insulation contractors indicate 25% to 35% reduction in cost of applied mastic finish.

foster COATINGS • SEALERS • ADHESIVES for thermal insulation

BENJAMIN foster CO.
Division of Amchem Products, Inc.
4635 W. GIRARD AVE. • PHILA. 31, PA.

SOLD BY AMERICA'S LEADING INSULATION DISTRIBUTORS AND CONTRACTORS

Circle 9021 opposite last page

All welded crown pulley high in traction, but easy on belt

All welded crown pulley is manufactured by a new technique. Combining features of conventional paper crown and flat face pulleys, it eliminates their disadvantages.

Only one welding seam — though the pulley is welded on both inside and outside for maximum strength — is used in the forming process.

Pulley's crown is accurately formed on the outer ends near the rim. This is where maximum training effect is needed to pull belt into line. Flat center face eliminates belt stretch and wear which can occur with conventional high-crown arrangements.

Center flat-face section and curved-crown ends provide advantages of both types of pulley

Squeeze-lock holds the pulley firm to the shaft without welding between hub and pulley end plates. No key ways are used either.

(Curve-Crown pulley is a development of Stephens-Adamson Mfg. Co., Ridgeway Ave., Aurora, Ill.)
Circle 9022 opposite last page.

Starts, stops equipment, sounds alarms on flow

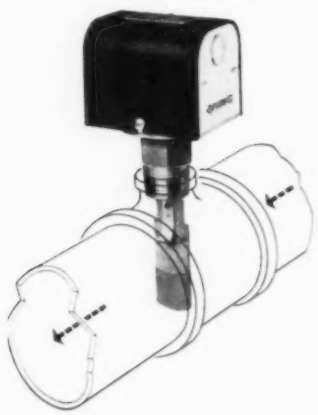
Switch can boost apparent capacity of hot water heater

Typical use of flow actuated switch might be in starting a burner of a hot water heater whenever water is drawn from its reserve. It can also be used for alarms and shut downs (if coolant flow stops, for example), automatic starting of standby equipment, proportioning systems, etc.

Used on lines handling up to 100 psi, 300°F, it senses flow with a paddle extending through a 1" Tee branch. Paddle length is chosen to fit line size from 1" up.

To seal against line pressure a packless phosphor bronze bellows is used. Paddle motion, transmitted through this bellows, actuates a magnet-assisted switch. Both normally open and normally closed actions are rated for 115 (at 7.4 amp) or 230 volts.

In addition, modified designs are available to generate their own millivoltage for signal purposes.



Phantom view of pipe shows how switch paddle extends into flowing liquid

There is no corrosion problem with most of the common plant liquids since metal parts in contact are all copper, brass or bronze.

Sensitivity of the switch is adjustable. Screwdriver setting of spring tension in the switch head accomplishes this. Switches are listed by Underwriters' Laboratories.

(FS4 Flow Switches are products of McDonnell & Miller, Inc., 3500 N. Spaulding Ave., Chicago 18, Ill.)
Circle 9023 opposite last page.

For more information on items reported in the New Developments section circle corresponding numbers on reader service card opposite last page.

Write for your copy

QUALITY...*All Metal*
Flexible Hose Products
Universal
METAL HOSE CO.

2167 S. Kedzie Ave., Chicago 23, Ill.

Circle 9024 opposite last page

STOP NOZZLE PLUGGING

RONNINGEN FILTERS

Ronningen Triplex 316 stainless steel filter with one filter removed for inspection.

316 stainless steel; steel; bronze; aluminum.

Manual or automatic. For water, petroleum, chemicals. Quick-coupling disconnect; reconnect in 60 seconds —no tools. Non-short circuiting. Filter element electric welded. Capacities, 10 to 1600 GPM. Pressures to 300 psi. Temperatures to 400°F.

Write for Bulletin #45570, Dept. P
STRAIN AGAIN WITH RONNINGEN
"Particles large or small, we filter them all"

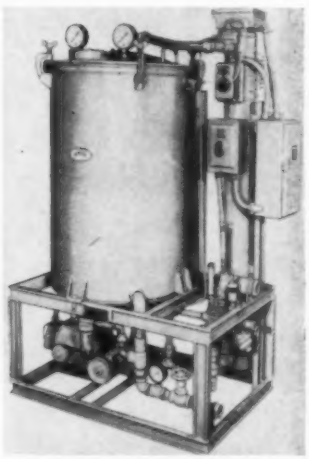
RONNINGEN — PETTER CO.
Vicksburg, Michigan Phone: Midway 9-5911
Representatives throughout U. S. and Canada

Circle 9025 opposite last page

Pulls out sludge, gases while dehydrating insulating oil

Self-contained system vacuum dehydrates oils. At the same time it deaerates and removes micro solids.

It is recommended for oils to 5000 SSU viscosities. Oil is forced through fiber glass filter element and disbursed into vacuum chamber where water and other volatiles are exhausted.



Unit filters, deaerates and dehydrates in a vacuum

Systems are available in three sizes and several types. (Fill-Thermo-Vac systems are a development of Bowser, Inc., Ft. Wayne, Ind.)

Circle 9026 opposite last page.

Deliver fuel oil at high pressure

Twin screw pumps for medium and high pressure use have application in pumping fuel oil for industrial and marine boilers. High pressure units can reach 1000 psig, others, 350 psig.

Using two pairs of intermeshing screws with timed driving gears, the pumps provide surgeless positive displacement.

(Type CB and TS screw pumps are products of Warren Pumps, Incorporated, Warren, Massachusetts.)

Circle 9027 opposite last page.

KIRK & BLUM

SHEET and PLATE FABRICATION for INDUSTRIAL PLANTS and UTILITIES

Whatever your requirements in sheet and plate fabrication . . . such as the mammoth breeching section shown here . . . call on KIRK & BLUM.

During the past 50 years, Kirk & Blum has acquired exceptional experience and complete facilities for fabricating carbon steel, stainless, aluminum, monel and other alloys up to ½" thickness.

Send prints for prompt quotations on your requirements, or write for your copy of the latest Kirk & Blum Sheet and Plate Fabrication Booklet.

• BREECHINGS • STACKS • AIR and GAS DUCTS
• CASINGS • LOUVERS • BINS and HOPPERS
• INSULATION JACKETING
• ALUMINUM and ALLOY FABRICATION
• CONTROL PANELS and DESKS

THE KIRK & BLUM MFG. CO.

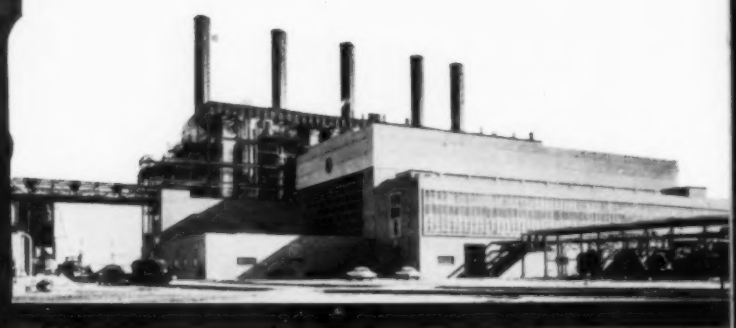
3174 Forrer Street, Cincinnati 9, Ohio

Circle 9028 opposite last page

Keeping step with a forward step

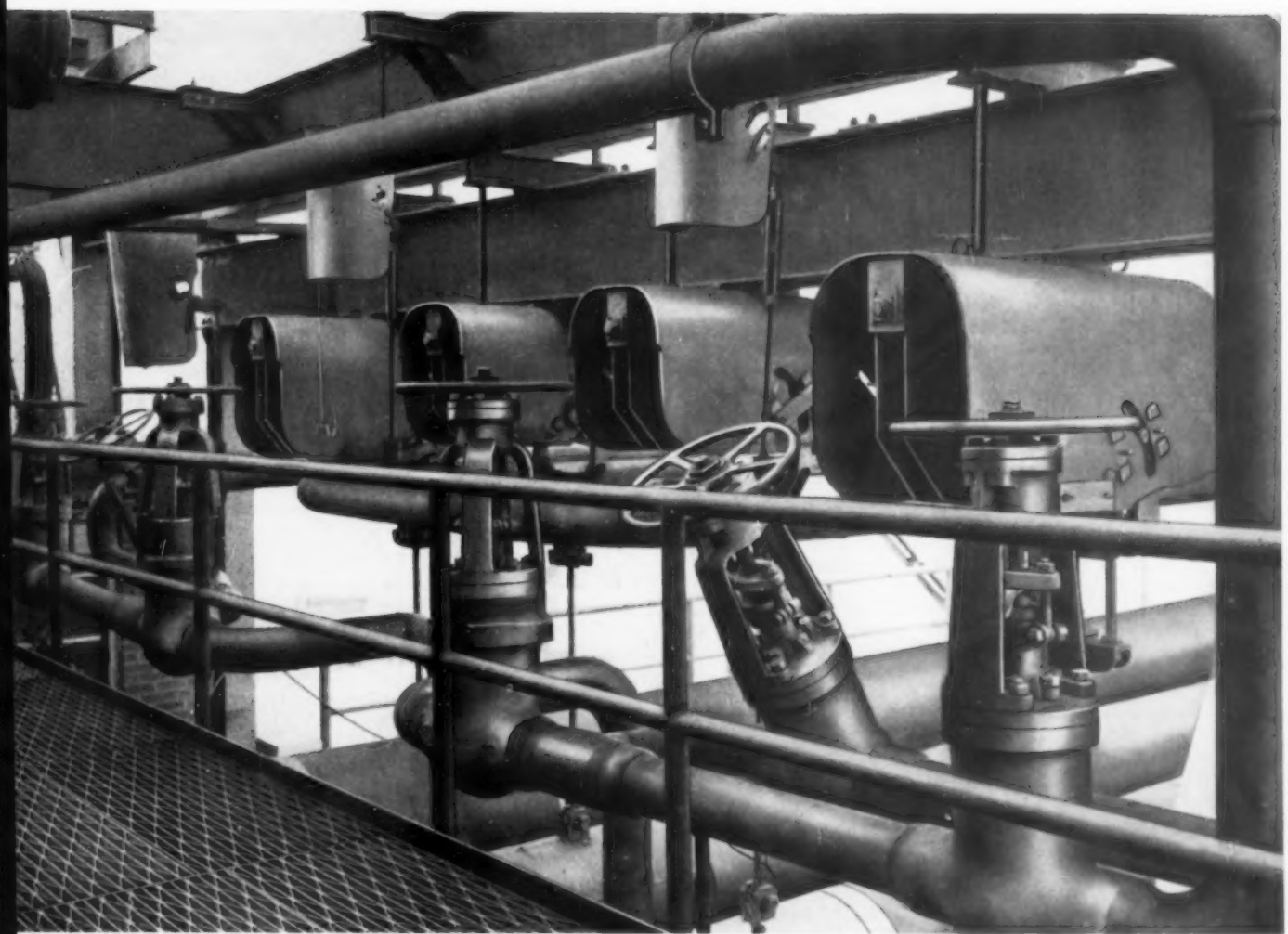
CHAPMAN VALVES

installed in the Linden Generating Station for the Public Service Electric and Gas Company of New Jersey



A Chapman high pressure alloy steel gate valve of the type specified for Linden. This valve has pressure seal body-bonnet connection, welding ends, and is equipped for motor operation.

in Steam Power Plant Engineering



Chapman valves in service at the Linden Station.

It's new. It's modern. And it's now in operation. The Linden Generating Station represents a forward step in steam power plant engineering. Designed by the Electric Engineering Department of the Public Service Electric and Gas Company, the plant was built by United Engineers and Constructors Incorporated. The size of equipment, the magnitude of the throttle and process flows, and high operating economy were involved. They sought and got lower operating costs with no increase in steam conditions.

Valves, of course, were also involved. Chapman engineers were prompt to work with the designers and builders of this new station and produce valves that fully met the specific requirements of each application. These included valves for high pressure heater inlets, valves for controlling atomizing steam to desuperheaters, valves for handling high pressure process steam and many others.

No matter what *your* valve requirements might be, it always pays in the first instance and *in the long run*, to talk with a Chapman engineer. Write, and we'll be promptly at your service.

For more information on product at left, circle 9029 see information request blank opposite last page.

The **CHAPMAN** *Valve Manufacturing Company*

INDIAN ORCHARD, MASSACHUSETTS

For over 75 years, Chapman engineers, metallurgists, manufacturing and testing facilities have concentrated on meeting usual and advanced requirements for power plants, water works, chemical plants, refineries and industrial use.

Circle 9030 opposite last page

At Niagara Mohawk there is dependable

REMOTE REPORTING

because there are

USG pneumatic transmitters

Selected by Hagan Chemicals & Controls Inc., as components of the Hagan complete combustion control system in the new Unit 67 at the Niagara Mohawk Huntley Station.

To assure uninterrupted and accurate relay of temperature and pressure intelligence to controllers, totalizers and actuators.

Because of USG sensitivity (0.1% of full scale) and freedom from dead spot; also high USG accuracy and extreme reliability in unattended locations. Where indication is required, USG 3½" duplex receivers are used—also selected for their accuracy and dependability.

Evidence of the quality engineering you will find throughout the complete USG line of pneumatic instruments. For comprehensive data, ask for Catalog 510.

Find Your Nearest Distributor in The 'Yellow Pages'

UNITED STATES GAUGE® USG
DIVISION OF AMERICAN MACHINE AND METALS, INC., SELLERSVILLE, PA.

Circle 9031 opposite last page

NEW DEVELOPMENTS

Water impurities — chemical "ties them up"

Treatment Method

- **Economical**
- **Gets existing scale**
- **Not sensitive to pH or temperature**

An unconventional approach to water treatment is saving money and solving some of the tougher treatment problems. It depends on chelating agents. (Pronounced *KEY-late-ing* for the Greek word *chelos*, meaning claw.)

Chelating agents are materials which chemically "grasp" unwanted impurities, keep them tied up so that they cannot come out of solution. They can also help dissolve impurities which have deposited as scale.

Uses to date include high- and low-pressure boiler feedwater, water supply systems, air conditioning, and refrigeration, among others. Formulation of the agent depends upon use.

Stable over a wide temperature range, these materials also work well at high pH values usually found in cooling towers, boilers, evaporative condensers, etc.

Cost telling factor

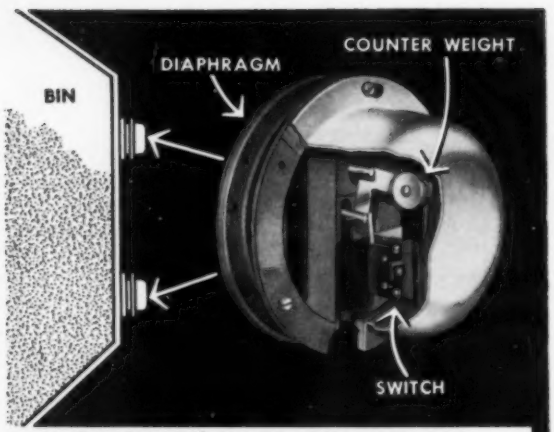
While not basically new, these materials are just beginning to show their effectiveness in water treatment. Cost varies with treatment requirements, but tests show a cost range of 10 to 12c per 1000 gal where conventional treatment had cost 15 to 18c.

Based on these and other developmental tests, manufacturer offers a free service arrangement to recommend formulation, dosage and other details.

Chelating agents themselves are liquids; they need not be weighed or mixed when used.

(Chelating agents are a product of North American Mogul Products Company, 2023 Standard Bldg., Cleveland 13, Ohio.)

Circle 9032 opposite last page.



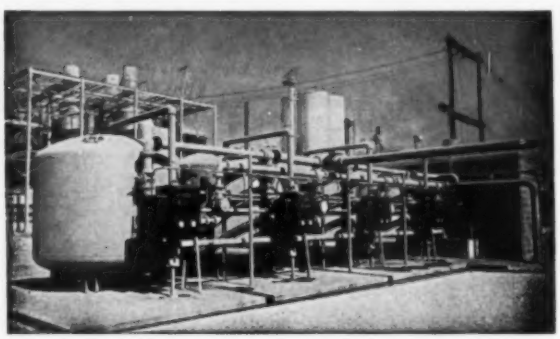
BIN-DICATOR® PAYS FOR ITSELF FIRST TIME IT PREVENTS BIN OVERFLOW, CONVEYOR CLOG, ELEVATOR CHOKE-UP, MACHINERY DAMAGE, REPAIR SHUT-DOWN

If you handle bulk material you probably need Bin-Dicators. The nominal cost of this protection and automatic control makes it the lowest-cost modernization you can buy. Available with Explosion-Proof Switch.

THE BIN-DICATOR CO. *Write for free copy of catalog BD-15 or call*
13946-V2 Korcheval • Detroit 15, Mich. VAlley 2-6952

WE SELL DIRECT • PHONE ORDERS COLLECT

Circle 9033 opposite last page



BOILER FEEDWATER TREATMENT

(for over half a century)

Complete plants for water softening, demineralization, silica removal, de-oiling of condensate, clarification, de-alkalizing and all other requirements.

Send for Bulletin BFT-11
or Nearest Field Representative.

WAY SERVICE HUNGERFORD & TERRY, INC.
CLAYTON 1, N. J.

Circle 9034 opposite last page

NEW LITERATURE

plant services — power services maintenance

Reviews of books and industrial bulletins describing equipment, supplies, services

Details bellows meters

Two models of bellows meters — one for metering flow and open-tank liquid level, other for metering closed-tank level — are described in four-page specification sheet.

Units are mercuryless and convert differential-pressure changes into motion to operate an indicator, recorder, controller, or transmitter.

(Spec S292-2 is issued by Industrial Division, Minneapolis-Honeywell Regulator Co., Wayne and Windrim Avenues, Philadelphia 44, Pa.)
Circle 9035 opposite last page.

Shows flow switch use

Typical applications of switches which will open or close with flow through a pipeline are illustrated and discussed in four-page bulletin.

Four models are available. Ratings on each are given.

(Bul FS-1 is issued by McDonnell & Miller, Inc., 3500 N. Spaulding Ave., Chicago 18, Ill.)
Circle 9036 opposite last page.

Flapper, wheel, or ball to show pipe's flow

Line of pipeline flow indicators is described in this bulletin. It explains how three types — flappers, paddle wheels, and balls — make possible visual checks on flow directions and condition of the fluid.

Temperature and pressure specifications are given for indicators. They extend up to 250 psig and 500°F.

(Bul 18W is issued by Schutte and Koerting Company, Dept. M-H, Cornwells Heights, Bucks County, Pa.)
Circle 9037 opposite last page.

How to get hot water by steam injection

Twelve-page brochure describes steam injection water heater for meeting instant requirements. Design features, specifications, engineering data, and illustrated installations are given.

(Instantaneous Steam Injection Water Heater Brochure is issued by Pick Mfg. Company, West Bend, Wis.)
Circle 9038 opposite last page.

Gives all the facts on Al conductors

Eighty-eight pages of engineering data on aluminum electrical conductors give a complete listing of approximately 4000 sag and tension charts.

Virtually every type of covered and bare aluminum conductor is covered. Booklet is punched for mounting in loose-leaf binder.

(Section DA2A, "Aluminum Electrical Conductors — General Engineering Data," is issued by Aluminum Company of America, 1501 Aloca Building, Pittsburgh 19, Pa.)
Circle 9039 opposite last page.

How to select and install quiet dry transformers

Seven guides for selecting and installing transformers for close proximity locations are given in an eight page bulletin released recently.

Contains charts on average ambient sound level of typical locations and suggested vibration isolating mountings for all available ratings.

(Bulletin GED-3424 is available from General Electric Co., Schenectady 5, N.Y.)
Circle 9040 opposite last page.

Detailed technical manual on storage battery use

Reports on recent engineering studies of the effect of temperature on battery capacity are among the information detailed in 24-page manual on use of stationary storage batteries.

Also included are tabulated data and general information necessary for: selection of batteries and charging equipment, proper battery and charger maintenance, selection of battery racks, and determination of battery discharge ratings.

(Bul 210 is issued by Exide Industrial Division of The Electric Storage Battery Co., Box 8109, Philadelphia 1, Pa.)
Circle 9041 opposite last page.

Details high pressure hydraulic cylinder

Complete details and dimensions for a line of high-pressure hydraulic cylinder are given in eight-page catalog.

There are 13 basic mounting styles available and a choice of rod sizes for each bore.

Feature of the line is an O-ring seal which will remain tight at all pressures.

(Cat 900 is issued by Hanna Engineering Works, 1765 Elston Ave., Chicago 22, Ill.)
Circle 9042 opposite last page.

Describes 39 torque wrenches

Four-page catalog sheet shows, describes and prices 39 torque wrenches and adapters. Typical configuration and formula for using it is shown.

(Bul SD-77-757 is issued by P. A. Sturtevant Co., Addison, Ill.)
Circle 9043 opposite last page.

Cleans conveyor belts

Technical data, specifications and illustrations on a spring type conveyor belt cleaner are listed in four-page bulletin.

(Bul 258 is available from Stephens-Adamson Mfg. Co., Ridgeway Avenue, Aurora, Ill.)
Circle 9044 opposite last page.

Shows efficiency curves for dust collector

Printed in two colors, eight page bulletin features efficiency curves for various sizes of dust. These show typical efficiency patterns as various conditions and variables of the system might be changed.

Several cutaway drawings and sketches of installations show how units are being put to use.

(Bul C-958 is issued by The Ducon Company, Inc., 147 E. Second Street, Mineola, New York.)
Circle 9045 opposite last page.

Describes and pictures air conditioning units

More than 30 pages of 56-page bulletin tell in detail how each section of the AAF-Herman Nelson Air Conditioning Unit may be selected to meet specific air capacity, temperature, and heating and cooling load requirements.

Coil selection information includes capacity table, correction curves and sample calculations. This information covers every situation in which steam-heating, hot-water, chilled-water, and direct-expansion coils are used.

(Bul 786 is available upon written request from American Air Filter Co., Inc., Dept. PD, 215 Central Ave., Louisville 8, Ky.)

If you use ACID CLEANERS look for this label . . . .

The manufacturer of an ACID CLEANER who displays this label on his product indicates he is using the finest Corrosion Inhibitor available.

For complete information on O'B-HIBIT and a list of manufacturers in your area who display this label, write:

O'B-HIBIT
P. O. Box 72
Caldwell, N. J.
Gentlemen:
Please send complete information on O'B-HIBIT Corrosion Inhibitor.

Name .....

Address .....

.....

.....

Circle 9046 opposite last page

NEW LITERATURE

Measures trace oxygen

Specification sheet gives details on dual-range instrument which continuously measures gas samples for minute quantities of oxygen, as low as 0 to 5 ppm. Instrument operation and specifications are included.

(Bul 0-4114 is issued by Process Instruments Div., Beckman Instruments, Inc., 2500 Fullerton Rd., Fullerton, Calif.)

Circle 9047 opposite last page.

For more information on items reported in the New Literature section, circle corresponding numbers on reader service card opposite last page.

Explains operation of feedwater regulator

Bulletin describes feedwater regulator that utilizes steam-flow and water-level influences acting through a thermostatic tube and direct-operated valve.

It explains, with a schematic diagram, application principles of the feedwater regulator and gives specifications of the various integrated parts.

(Bulletin 1045 is available from Copes-Vulcan Division, Blaw-Knox Co., Erie, Pa.)

Circle 9048 opposite last page.

How to select refractories

Twenty-four page booklet has been written to aid in selection of proper refractory products for high temperature applications.

Considerable technical data, tables, graphs, conversion charts (including a circular temperature conversion chart) are presented.

("Refractory Brick and Other Shapes for Industry" is available from Publicity Department, Norton Company, Worcester 6, Mass.)

Circle 9049 opposite last page.

BOILER TUBE COMPANY OF AMERICA

McKEES ROCKS, PA. (Pittsburgh District) Federal 1-7750

Circle 9050 opposite last page

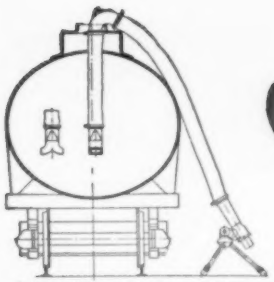
IDEAL

You can depend on WIEDEKE quality

PACKAGE BOILER
. . . and Stationary Fire Tube Boiler Tubes can be rolled and flared in one operation with this Modern Parallel Rolling Tube Expander.
See your Dealer or Write us for Bulletin 3400.
Guard holds Flare Roll back—desirable for rolling Tubes closely spaced in thin Tube Sheets.

THE GUSTAV WIEDEKE COMPANY
DAYTON 1, OHIO

Circle 9051 opposite last page



TANK CAR is easily freed of fumes for workers' safety.

CHEMICAL STILL is here ventilated while being repaired.

KEEP AIR FRESH

in confined places with COPPUS *Design "A" Ventilator*

Improve workers' safety—health—comfort—efficiency. Get rid of dangerous gases, fumes, stagnant air. Coppus Design "A" Ventilator ventilates tanks, tank cars, drums, vats, underground cable manholes, pipe galleries, airplane wing compartments, fuselages. For complete information, write Coppus Engineering Corporation, 189 Park Ave., Worcester 2, Mass. Sales Offices in *Thomas' Register.*

Other "Blue Ribbon" Products in *Chemical Engineering Catalog, Refinery Catalog, Best's Safety Directory* and *Mining Catalogs.*

ANOTHER COPPUS "BLUE RIBBON" PRODUCT

Circle 9052 opposite last page

Designed to CUT MAINTENANCE COSTS

ON PIPE, PIPE JOINTS, CONDUIT, CABLE AND TIE RODS

Depend on TAPECOAT®

..the Quality Coal Tar Coating in Handy Tape Form

For your preventive maintenance program, you need the best possible protection at the lowest possible cost. Since 1941, TAPECOAT has proved its superiority in combating corrosion. This quality coal tar coating in handy tape form resists the corrosive hazards around power plants, coal hoppers, conveyors, etc. It's self-bonding—easy to apply with use of a torch. No skilled help needed. And it's low in cost considering its quality and continuing protection. Comes in rolls of 2", 3", 4", 6", 18" and 24" widths.

Write for brochure and prices

The TAPECOAT *Company*

Originators of Coal Tar Coating in Tape Form

1531 Lyons Street, Evanston, Illinois

Circle 9053 opposite last page

CUT HERE AND FILE

POWER INDUSTRY

nomograph 9

Viscosity of Steam

D. S. DAVIS

Head, Department of Pulp and Paper Technology

University of Alabama

Recent data[2] show that the viscosity of superheated steam is linear with temperture at pressures between atmospheric and 1500 psi.

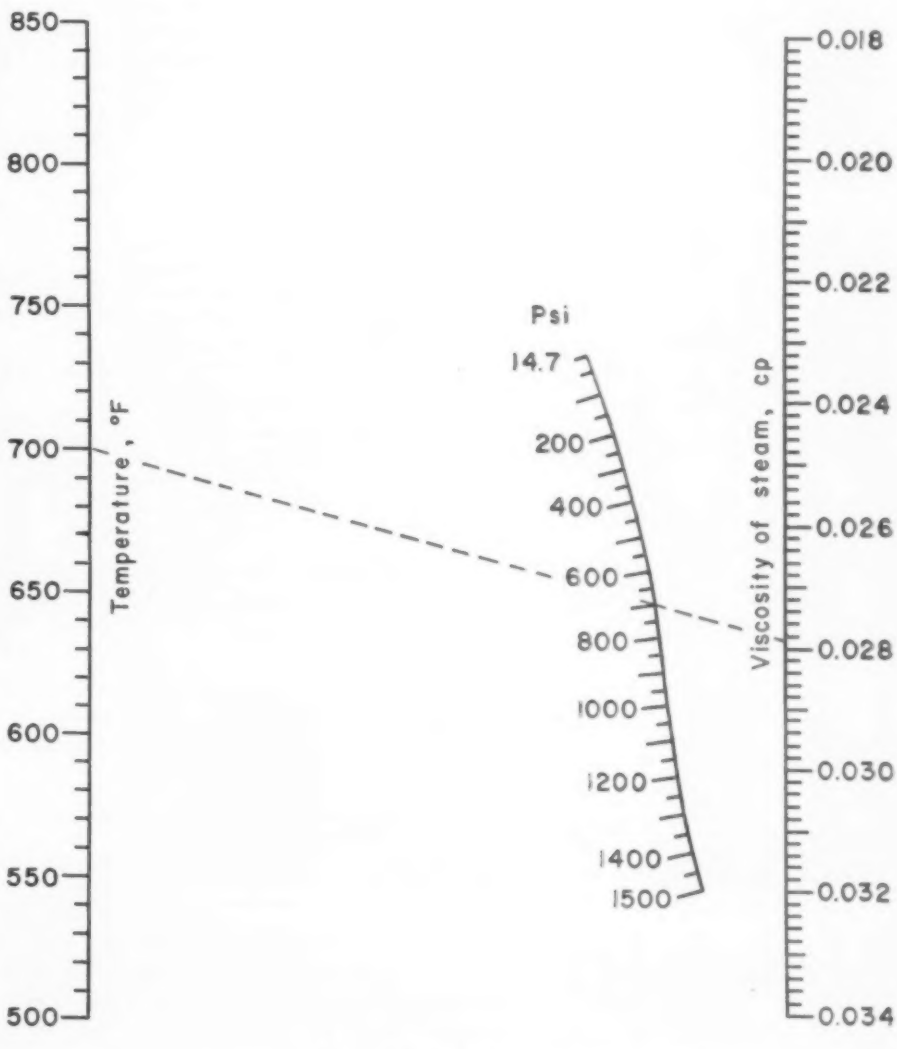
Accompanying line coordinate chart, constructed by means of standard methods[1], extends considerably the utility of the original isobars.

The broken index line shows that the viscosity of steam at 700 psi and at 700°F is 0.0279 centipoise.

LITERATURE REFERENCES

1) Davis, D. S., "Nomography and Empirical Equations," Chap. 10, Reinhold Publishing Corp., 1955, New York

2) Kollen, H., *Power*, 100 (3) 154, 1956



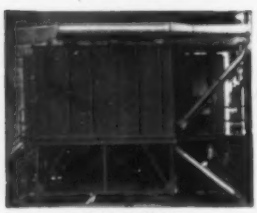
Courtesy of Chemical Processing

from coast to coast...

Norblo

Automatic Dust and Fume Collection delivers dependable heavy duty service at low cost

CALIFORNIA



MISSISSIPPI

MANITOBA

Of all the major types of dust and fume collection systems, the modern automatic bag type process as developed by The Northern Blower Company is the most widely useful and adaptable. Its use in important large scale production processes extends from coast to coast, and to foreign lands.

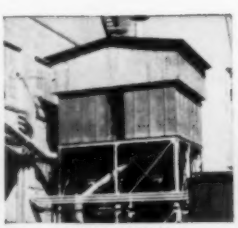
Norblo's experience in the removal of injurious or "nuisance" industrial air contaminants as well as salvaging valuable materials has been extensive in most industries. Complete systems are engineered to specific situations. Equipment can be supplied for intermittent use or for 'round-the-clock full capacity requirements. Fully coordinated functional design results in high efficiency, low cost of operation and maintenance.

Norblo engineers the complete installation with ample capacity for your needs, with wide adjustability and all the safeguards you may need. It will pay you to have Norblo engineers study your requirements. Write for Bulletin 164.

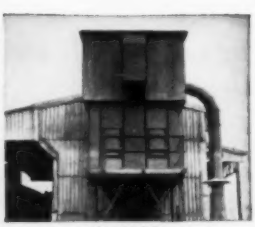
The Northern Blower Company

6422 Barberton • Cleveland 2, Ohio
Telephone: OLympic 1-1300

OHIO



NEW YORK



MEXICO

Norblo ENGINEERED DUST COLLECTION SYSTEMS FOR ALL INDUSTRIES

Circle 9054 opposite last page

NEW LITERATURE

How to weld aluminum described in film

Techniques on welding aluminum are demonstrated in 33-minute, full-color sound movie. The 16-mm film, titled "Aluminum Welding . . . Different, Not Difficult," is available without charge.

A 28-page technical brochure of the same title is supplied for movie's audience.

(Requests for bookings should be addressed to Reynolds Metals Co., Advertising Distribution Center, Richmond 18, Va.)

Hollow shaft motors

Four-page picture bulletin tells story of line of vertical hollow-shaft motors for powering turbine pumps. Dimensions and specifications on the weather-protected, totally enclosed, and explosion-proof motors are included.

(Bul MM161 is issued by Electric Motor Div., A. O. Smith Corp., Tipp City, Ohio.)
Circle 9055 opposite last page.

Continuous belt weigher

Two-page bulletin describes features and operation of belt weigher for continuous weighing of dry materials.

Full dimensions of unit are given.

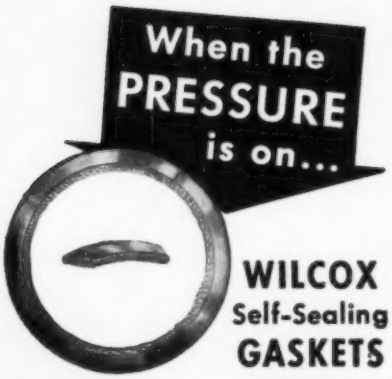
(Bul 36-P1 is issued by Omega Machine Co., Division of B-I-F Industries, Inc., Providence 1, R.I.)
Circle 9056 opposite last page.

How to strip paint

"How to Strip Paint" is subject of eight-page booklet.

Recent development of synthetics has made paint stripping a more difficult problem. Booklet specifies material and method for simplifying that problem.

(Booklet F7893 is available from Oakite Products, Inc., 157 Rector St., New York 6, N. Y.)
Circle 9057 opposite last page.



WILCOX Self-Sealing GASKETS HOLD

The greater the pressure, the tighter it holds. Nothing can beat this Wilcox Self-Sealing Gasket as proved in years of service.

The U-shaped metal outer cover is packed with a resilient filling (usually rubber or asbestos). Pressure exerted on the elastic filling forces it into the cover, putting force against the adjacent flange surfaces. Thus, pressures that tend to blow ordinary gaskets make the Wilcox tighter.

Available with covers of copper, lead, tin, aluminum, monel, stainless steel, etc., in all sizes, standard or special.

Write for Bulletin No. 569 and prices

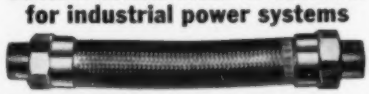
CHICAGO-WILCOX MFG. CO.

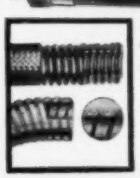
7725 South Avalon Avenue
Chicago 19, Illinois

Circle 9058 opposite last page

COBRA® FLEXIBLE SEAMLESS METAL HOSE

Custom constructed assemblies for industrial power systems





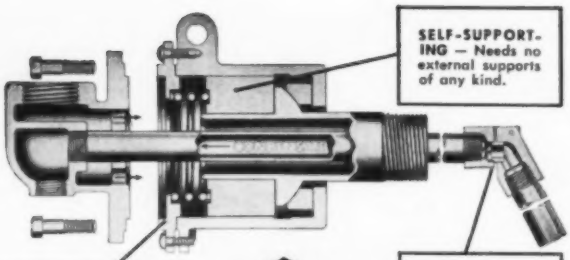
All sizes in bronze, stainless or carbon steel, monel, inconel and low carbon nickel. Seamless spiral or parallel corrugation... Braided. All type of fittings and flanges welded, brazed or soldered. Also, interlocked hose.

write — wire — phone: RE 7-3311
...for prices and catalogs

COBRA METAL HOSE

5059 S. Kedzie Ave. • Chicago 32, Ill.

Circle 9059 opposite last page


SELF-SUPPORTING — Needs no external supports of any kind.
ASSEMBLY PLATE — Holds internal parts in position when head is removed.
SYPHON ELBOW — Permits use of straight pipe for syphon. Can be inserted or withdrawn right through the joint.

Johnson Rotary Joint with SYPHON ELBOW

Johnson Joints represent the best way industry has yet found to get steam or liquids into rotating rolls and cylinders. They are completely packless, need no lubrication or adjustment. The Type SBP shown gets steam in, condensate out, through the same head. Other types available for through flow service, in sizes to meet all operating needs. ***WRITE FOR COMPLETE INFORMATION.***

The Johnson Corporation

807 Wood St., Three Rivers, Mich.

Circle 9060 opposite last page

FREE 28 PAGE CABLE TRAY CATALOG

Completely illustrated with full data and specifications on:

GLOBETRAY . . . the Superior Ladder type tray.

CABLE-STRUT . . . the Superior Basket type tray.

(Interchangeable at any point in the system.)

A must for architects, consulting engineers, and designers interested in trays for the support of cables, wiring and tubing used for power and communication instrumentation, where speedier installation is desired. A full line of accessories is available.

Write for your copy TODAY.

PRODUCTS DIVISION THE GLOBE CO.

4036 S. Princeton Ave., Chicago 9, Illinois

Circle 9061 opposite last page

Variable speed control

Full-color brochure gives information on operation and application of variable speed drive and pneumatic control systems.

Systems can be set up to give precise control by pressure, liquid level, humidity, rewind tension, filtering action, temperature maintenance, proportional flows, multiple motor speed control and constant cutting speed.

(Bul F-1882 is available from US Electrical Motors Inc., Advertising Dept., PO Box 2058 Terminal Annex, Los Angeles 54, Calif.)
Circle 9062 opposite last page.

Gives technical data on expansion joints

Eighty-page catalog contains tables of dimensions and weights for expansion joints from 3 to 72″ in diameter.

Complete information for rating expansion joints subjected to axial or lateral movement, angular rotation, or combination of these movements is included. There are formulas and tables for calculating the forces and bending movements developed.

(S-R Expansion Joint cat is issued by Badger Manufacturing Company, 230 Bent St., Cambridge, Mass.)
Circle 9063 opposite last page.

Announces solid, dry film lube

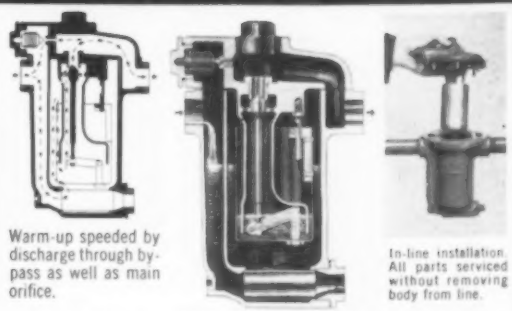
Matrix-bonded solid, dry film lubricant is announced in four-page bulletin.

The lubricant utilizes a metallic bonding principle that considerably increases the number of applications where solid film lubrication may be used.

Applications are described, and performance curves are presented to show endurance.

(Surf-Kote M-1284 bul is available from Sales Promotion Dept., Hohman Plating and Manufacturing Co., 814 Vermont Ave., Dayton, Ohio.)
Circle 9064 opposite last page.

NOW — A STEAM TRAP THAT KNOWS WHAT IT'S THERE FOR!



Warm-up speeded by discharge through by-pass as well as main orifice.

In-line installation. All parts serviced without removing body from line.

AUTOMATICALLY REGULATES FOR FASTER WARM-UP AND TO KEEP OPERATING TEMPERATURE AT PEAK HEAT

Proven bucket design with built-in accessories. By-pass thermostat increases discharge for warm-up and overload conditions. Thermostat compensated to operate at 10° below saturated steam temp. Wright-Austin Airxpel principle provides for mechanical discharge of air after Thermostatic by-pass has closed.

WRITE FOR BULLETIN 808

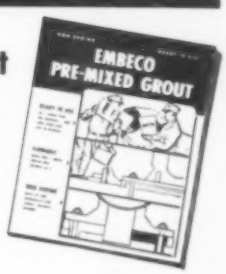
WRIGHT-AUSTIN COMPANY

3245 WIGHT STREET • DETROIT 7, MICH.

Circle 9065 opposite last page

GET THIS FREE GROUTING GUIDE

. . . before you Grout another piece of heavy equipment



Send for this *free* grouting guide which clearly illustrates 11 common machinery settings, methods of grouting and forming, and hot and cold weather grouting. Discussion covers proper mixing and placing of grout, reasons for using prepared, non-shrink grout, etc.

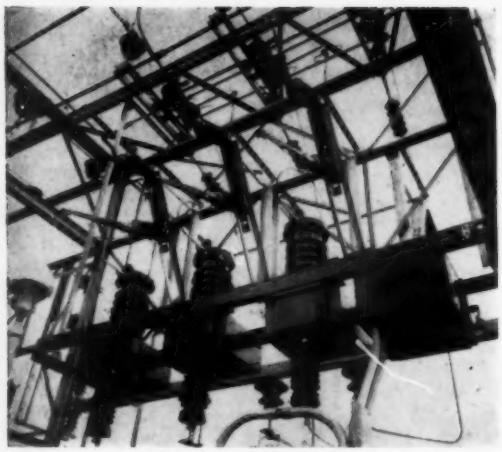
DIVISION OF AMERICAN-MARIETTA COMPANY

the MASTER BUILDERS co.

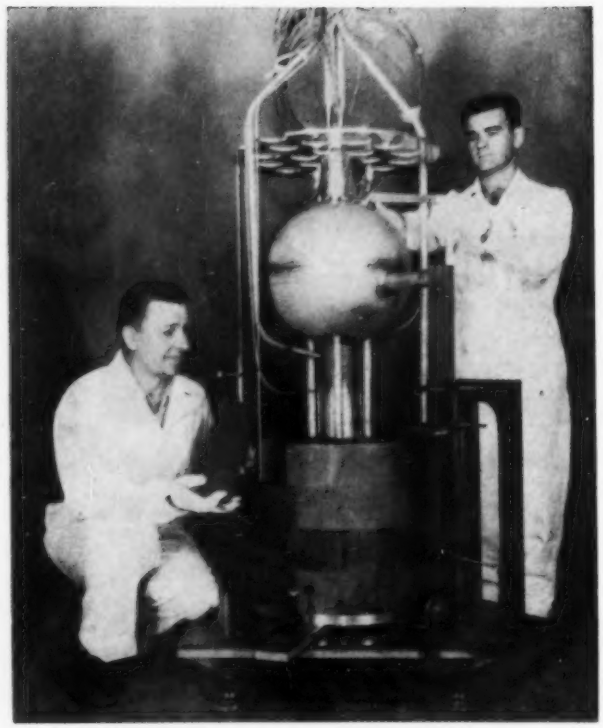
CLEVELAND 3, OHIO TORONTO 9, ONTARIO

Circle 9066 opposite last page

PHOTO NEWS



SULFUR-HEXAFLUORIDE GAS is the insulating medium between bushing condenser and porcelain casing on these 46-kv circuit breakers. Entire structure consisting of condenser type bushing (shown extending downward from mounting plate) is charged to a pressure of 60 psig. The breakers have a minimum interrupting rating of 250 mva and an interrupting time better than its specified eight cycles.
(Sulfur-hexafluoride circuit breakers were developed by Westinghouse Electric Corp., Box 2278, Pittsburgh, Pa.)
Circle 9067 on Reader Service Card.



THIS IS THE CORE of a 50-kw reactor being built by Atomics International for installation at Milan, Italy. Here technicians are fitting precision-milled graphite reflector blocks about the upside down reactor "heart." Fuel will be uranium in a water solution.

STRAIGHTEDGE — PAUL BUNYON SIZE. This 12-ft magnesium instrument was manufactured by Monarch Tools Inc., Lynwood, Calif., for Diamond Gardner Corp. Actually the 178-lb tool was designed to fulfill customer's need for a large straight edge which would hold close accuracies over a long span and yet be light enough for easy handling around the shop.

HIGH TEMPERATURE TESTING of graphite-base materials is being conducted at National Carbon Co., Div. of Union Carbide Corp. Positioned in a jet of exhaust gases traveling at five times speed of sound from oxygen-kerosene flame, specimen reaches temperature of 5000°F in a few seconds. Conventional graphite erodes beyond tolerable limits in about eight seconds, but materials that hold dimensions ten times longer are being produced.

FROM OUTER SPACE? Actually they are spray assemblies used in industrial air conditioning units. Sprays set up a small hurricane which cools and cleans the air by removing lint and other airborne particles.
(Spray Assemblies are used in air conditioning units manufactured by Carrier Corp., Syracuse 1, N.Y.)
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GRAPHIC SYSTEMS

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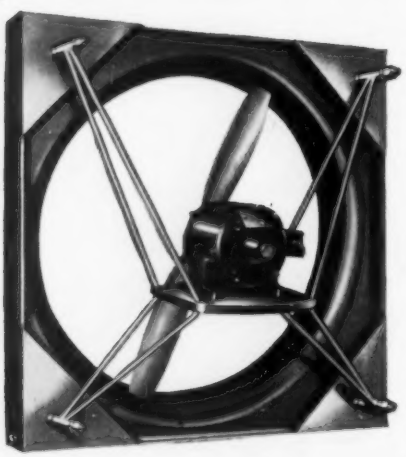
How a wise plant modernization program produced more effective ventilation:

Hartzell Panel Fans Replace Monitor Windows



Hartzell square steel panel mountings mean real savings on installation costs for many applications. Any standard or Lo-Noise Hartzell propeller in 24", 28", 32", 36", 44" or 48" diameters is available in this type of construction.

When the monitor windows in this large eastern metal-working plant required repairs, they were removed and replaced with Corrulux translucent panels. Twenty-nine Hartzell 44" direct-drive panel fans were installed to give positive, effective ventilation in place of the uncertain, erratic ventilation achieved by natural draft through the old tilting windows. Improved ventilation throughout the building was an immediate result. The fans were installed with motors on the outside so that all maintenance can be handled from the roof.

This installation suggests one of many ways in which Hartzell fans can be used to improve general plant ventilation. If it is adaptable to your plant, you'll find it a highly economical solution. But no matter what your plant ventilation problem, Hartzell has the fan or ventilator to help you solve it . . . and your nearby Hartzell field engineer has the ventilating "know-how" to help you plan the best installation at the lowest possible cost. If you don't know him, drop us a line for his name and address.

This installation was handled by the Hartzell field office at 333 Arch Street, Camden, New Jersey; phone WOodlawn 4-5256.

Why You Can Count on Hartzell Air-Moving Equipment for Long Life Rugged Reliability and Minimum Maintenance

Hartzell fans and blowers are engineered and built for the exacting requirements of tough industrial service. There's no compromise with quality for the sake of shaving a few dollars on price. Hartzell fans are designed for the industrial buyer who is willing to pay for long life, dependable service and low maintenance.

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PROPELLER FAN CO.
Div. of Castle Hills Corp.
53 Thomas Blvd. • Piqua, Ohio

ENGINEERING OFFICES IN PRINCIPAL CITIES

Circle 9071 opposite last page

NEW LITERATURE

Offers handy data card on tube pressure

Data card lists maximum allowable working pressures, by popular tube sizes, for electric-resistance welded boiler tubing.

Information is based on latest edition of ASME Boiler Construction Code and covers tubing for both water-tube and fire-tube boilers.

(Data Card TDC-157 is available from The Tubular Products Division, The Babcock & Wilcox Company, Beaver Falls, Pa.)

Circle 9072 opposite last page.

How to select silicone insulating components

Selection guide to silicone insulating components has been published in six-page, fold-out brochure.

Included in the guide is description of a step-by-step procedure for winding electric motors.

Sources of supply are listed.

(Bro 10-109 is issued by Dow Corning Corp., Midland, Mich.)

Circle 9073 opposite last page.

Electronic Coal Purchase

(*Continued from page* 10)

Program does not stop here. A second output from the unit cost program is an m × x cost matrix in the form needed by the linear programming program.

In addition, coal supply available from each mine and requirements at each station must be included. To account for different heating values, tonnages are multiplied by heating values to give total energy values.

As there must be an equality between Btu's supplied and required, the balance is made by adding a fictitious station. Other adjustments are made when practical considerations so dictate. ■

THAT'S INTERESTING

Crash-proof car

A car that keeps passengers from being thrown in an accident has been designed at Cornell University Aeronautical Laboratory. Liberty Mutual Insurance Co. in Boston sponsored project.

Driver's seat is placed in center of car for better vision and control. Passenger seats are lower and a little behind driver. Bumpers are backed by cellular plastic to absorb impact. Rollover bars on roof keep roof from collapsing if car turns over.

Roof is padded and of thicker metal than ordinary cars. Other features, such as safety belts, better door locks, safer steering posts, are already being used in new cars.

Hearing stars

New amplifier developed at Harvard University extends range of radio telescopes 10 times farther out into space. May enable scientists to hear radiation from hydrogen clouds in galaxies far beyond range of present instruments.

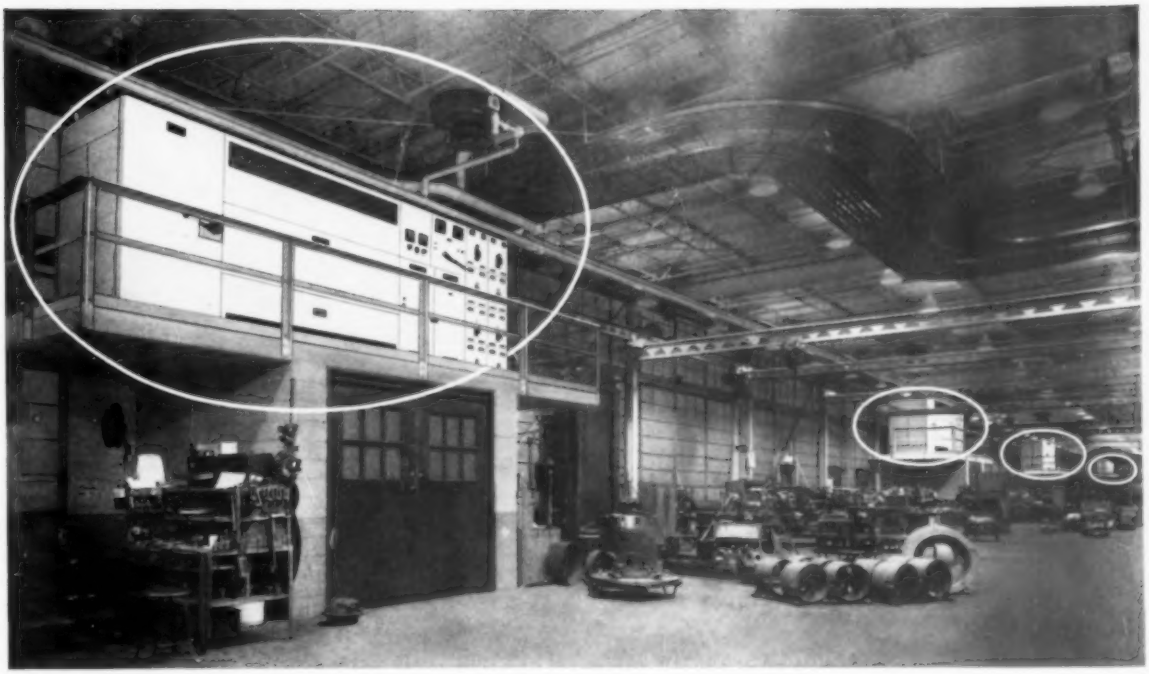
Affairs of heart

Capacitance heart sound pickup detects chest wall movements as small as ½ billionth of an inch to aid in early diagnosis of heart valve defects. Instrument is so sensitive that in a sound-proof room it detects normal sounds from flow of blood through heart and large blood vessels.

A lot of hot air

Two electrostatic precipitators will handle the gas volume of 1,116,000 cfm at Commonwealth Edison's new No. 7 unit in Waukegan, Ill., when it goes into service.

Designed and built by Metal Products Division of Koppers, the twin units will knock out 600 pounds a minute of fly ash.



Another important installation of SORGEL dry-type transformers and substations

This time in the modern LOUIS ALLIS plant in Milwaukee where the renowned motors are built

In this newest addition to the Louis Allis plant, the economy of high voltage efficient distribution was achieved with 13,200 volt distribution to three 1000 Kva and one 500 Kva substations, installed at various load centers.

These substations, equipped with SORGEL dry-type transformers, are so compact that they could be installed on balconies, thus gaining more floor space available for production.

This installation saved the Louis Allis Co. thousands of dollars over a low voltage distribution system, and provided them with the efficiency that only a high voltage distribution can provide.

Again the ingenuity of the principals and engineers, combined with SORGEL expert engineering, resulted in a most modern, flexible, space-saving and efficient electric distribution system.

Consulting Engineers — Klug & Smith Co.
Electrical Contractors — Uihlein Electric Co.

Electrical manufacturers are in a position to judge the quality of electrical equipment — that is why so many use SORGEL dry-type transformers in their plants and with their product.

These quiet SORGEL dry-type or Askarel-cooled transformers are available with any make or type of switchgear, and from any switchboard manufacturer in all ratings up to 10,000 Kva and 15,000 volts.

Sales engineers in principal cities.
Consult the classified section of your telephone directory or communicate with our factory.

SORGEL DRY-TYPE Transformers

40 years' experience in the development, manufacturing and application of transformers.

SORGEL ELECTRIC CO., 841 West National Avenue, Milwaukee 4, Wisconsin

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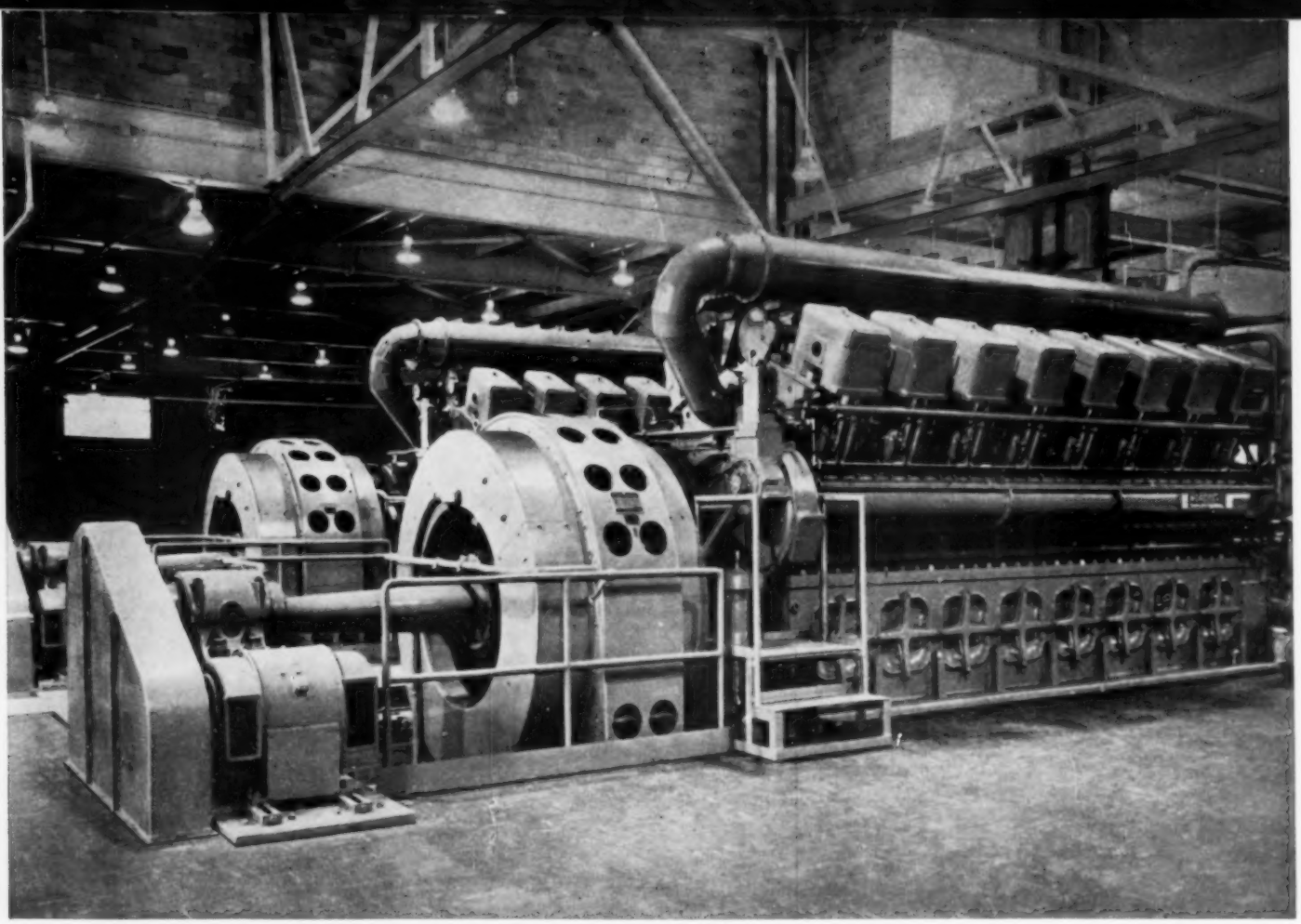

Texaco Ursa Oil lubricates each of these V-type 16-cylinder diesels which supply standby power in Narragansett Electric Co.'s Westerly, R. I., plant.

Bore and stroke of each engine is 13 x 16½"; each is rated at 3,500 hp at 514 rpm. Each generator has a net rating of 2,500 kw.

Texaco Ursa Oil protects Narragansett's reserve power

Narragansett Electric Company uses these two Supairthermal V-16 diesels for standby power. It's essential that these engines be instantly available, even after long periods of idleness. That's why Narragansett uses Texaco Ursa Oil to protect engine power, keep it reliable and ready—anytime.

With Texaco Ursa Oil in the crankcases, Narragansett engineers are certain of getting full rated horsepower because Texaco Ursa Oil keeps rings free and prevents the formation of harmful deposits. And because Texaco Ursa Oil is a premium quality lubricant, it protects against wear, minimizes operating and maintenance costs.

There is a complete line of Texaco Ursa Oils refined and processed especially for the lubrication of diesel, gas and dual-fuel engines. In fact, *for over twenty-years, more stationary diesel horsepower in the United States has been lubricated with Texaco than with any other brand.*

Your Texaco Lubrication Engineer offers his years of experience to help you select the right Texaco lubricant for your needs. You can contact him by calling the nearest of the more than 2,000 Texaco Distributing Plants, or by writing: The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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